U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF SOILS
IN COOPERATION WITH THE STATE SOIL SURVEY OF
THE UNIVERSITY OF NEBRASKA

SOIL SURVEY OF KEARNEY COUNTY NEBRASKA

BY

M. H. LAYTON, IN CHARGE, A. N. HUDDLESTON, AND
G. E. CONDRA, OF THE NEBRASKA SOIL SURVEY,
AND F. A. HAYES, OF THE U. S. DEPARTMENT
OF AGRICULTURE

[Advance Sheets—Field Operations of the Bureau of Soils, 1923]

WASHINGTON
GOVERNMENT PRINTING OFFICE
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[PUBLIC RESOLUTION—No. 9.]

JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided,* That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved, March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]

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SOIL SURVEY OF KEARNEY COUNTY, NEBRASKA

By M. H. LAYTON, in Charge, A. N. HUDDLESTON, and G. E. CONDRA, of the Nebraska Soil Survey, and F. A. HAYES, of the United States Department of Agriculture [1]

DESCRIPTION OF THE AREA

Kearney County is in the south-central part of Nebraska, in the second tier of counties north of the Kansas State line. Minden, in the central part of the county, is about 140 miles southwest of Lincoln. The county is almost square, although its northern boundary follows the south bank of the Platte River and is somewhat irregular. It comprises an area of 516 square miles, or 330,240 acres.

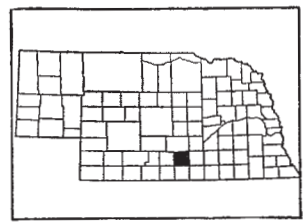


FIG. 15.—Sketch map showing location of the Kearney County area, Nebraska

Kearney County may be described as consisting of parts of two major topographic divisions, known in the State surveys as the Nebraska and Platte plains.[2] The former occupies the southern four-fifths of the county and includes the entire upland portion. The latter consists of a broad low-lying plain or valley extending across the northern part and represents a part of the Platte River alluvial lands.

The surface of the uplands is prevailingly flat to gently rolling. The more sandy parts, however, have a choppy to hummocky relief, and in places where wind action has been especially severe the topography is rather hilly. The latter condition prevails in a narrow strip along the southern edge of the Platte River alluvial lands in the northern part of the county and in local bodies along a few of the tributaries of Sand Creek in the southeastern part. In these localities the wind has piled the incoherent sands into dunes 30 to 40 feet high. Locally within the Sand Creek drainage area, in the east-central part of the county, the valley slopes are rather steep and the divides narrow, though well rounded, creating a gently rolling topography. The surface of the remainder of the uplands has little relief beyond that produced by a few shallow draws or swales, scattering depressions, and slight elevations.

The second topographic division, the Platte plain, has been created by the erosion of the Platte River, producing the broad low-lying strip of alluvial land along the northern county boundary. It has a flat to very gently undulating relief, locally modified by shallow stream channels, old cut-offs, depressional areas, and slight elevations. The surface lies 40 to 100 feet below the general upland levels, and the intervening slopes are long and gradual. The first

[1] Report written by F. A. Hayes.
[2] G. E. Condra, State geologist and director State soil survey.

bottoms or flood plains, which include about 50 per cent of the alluvial land, occupy a broad, continuous strip bordering the Platte River and its south channel across the county. The surface lies only a few feet above the normal flow of the streams. The terraces or second bottoms occupy the southern part of the alluvial lands. They lie from 3 to 12 feet above the flood plains and represent remnants of older bottom lands left by the streams when they intrenched.

Kearney County has a general elevation of 2,150 feet where the south channel of the Platte River crosses the northeast corner, to about 2,300 feet near Wilcox in the extreme southwest corner. The average elevation along the western county line is about 2,200 feet and that along the eastern boundary is 2,050 feet. The Platte River alluvial lands along the northern county line average 2,050 feet above sea level. The elevation of Norman is 2,008, Lowell 2,072, Heartwell 2,097, Newark 2,103, Minden 2,165, Keene 2,211, Axtell 2,222, and Wilcox 2,229 feet above sea level. The general slope is toward the east.

The drainage of the county is effected through the Platte River and its tributaries and through the headwaters of tributaries leading into the Republican and Little Blue Rivers. The main channel of the Platte River flows along the northern county line to about the Burlington Railroad bridge northwest of Newark. At this point the stream divides, and its south channel forms the remainder of the northern boundary. The western, northern, and central parts of the county drain north and east into the Platte or its south channel either directly or through Dry and Lost Creeks. A small area in the southwestern part drains southward through the headwaters of Thompson Creek into the Republican River in Franklin County. The run-off in the southeastern and east-central parts flows east through Sand and Cottonwood Creeks into the Little Blue River in Adams County.

The rivers and creeks afford good local drainage. In the flatter parts of the uplands, however, stream channels are poorly developed and run-off is rather slow. Water often collects in numerous shallow depressions and remains on the surface for periods of a few days to several weeks. The largest depressions are in the southwestern part of the county. Much of the surplus moisture in the northern part finds its way to the Platte River through subterranean channels in the loose, porous sands.

The first white men to locate in the area now included in Kearney County were soldiers sent by the Government to protect the emigrants from Indian attacks along the Oregon Trail. Fort Childs was established in 1848 on the south side of the Platte River, about 2 miles west of the present town of Newark. The name of this fort was later changed to Fort Kearney. During the next few years traders, trappers, and hunters from Eastern States located around the fort, and the town became known as Kearney City. In 1860 the Territorial Legislature of Nebraska established Kearney County with Kearney City as the county seat. The county then comprised all the territory between the Platte River and the Kansas line and included the present areas of Kearney, Franklin, Harlan, and Phelps Counties. Subsequent legislation established its present boundaries, and Minden became the county seat.

According to the 1920 census, the population of the county is 8,583. It is all classed as rural, as there are no cities having 2,500 inhabitants. The density is given as 16.6 persons per square mile. Settlement is evenly distributed throughout the county, though it is somewhat denser in the vicinity of the towns and is rather sparse in the more sandy upland sections.

Minden, the county seat and largest town, has 1,527 inhabitants and is in the central part of the county. Heartwell, Axtell, Norman, Keene, Wilcox, Newark, and Lowell are small towns and villages scattered throughout the county. They are important local distributing centers and markets for farm implements, supplies, and produce.

The transportation facilities are good. A main line of the Chicago, Burlington & Quincy Railroad crosses the county in a northeast-southwest direction, and branch lines traverse the county in several directions. Except for a small area in the northwest corner, no point is more than 9 miles from a railroad station.

The county has a good public-road system. It is crossed by the Detroit, Lincoln, and Denver Highway from east to west and by a State highway from north to south. Most of the public roads follow land lines regardless of topography. All are dirt roads, except portions of the highways which have been surfaced with gravel. The more important roads, such as the highways and those between the several towns, are dragged as soon after each rain as possible and kept in good repair. Little attention is given the minor roads, though they are seldom allowed to become impassable. Travel is rather slow and laborious on some of the minor roads crossing the more sandy lands in the northern part of the county, but detours are usually provided, and during extremely dry weather many of these roads are surfaced with coarse hay or straw. Most of the culverts and bridges throughout the county are of cement or steel construction.

Telephones and rural-delivery routes reach all sections of the county.

CLIMATE

The climate of Kearney County is favorable for the growing of hay crops, vegetables, and grain and the raising of livestock. The long, warm summers are favorable to corn, and the low temperatures sometimes occurring in winter seldom destroy winter-grown crops owing to the protection of snow. There is not sufficient variation in surface characteristics to cause any appreciable differences in climate within the county.

The following table, compiled from the records of the Weather Bureau station at Minden, in the central part of the county, shows the normal monthly, seasonal, and annual temperature and precipitation:

Normal monthly, seasonal, and annual temperature and precipitation at Minden

[Elevation, 2,169 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1894)	Total amount for the wettest year (1879)	Snow, average depth
	°F.	°F.	°F.	Inches	Inches	Inches	Inches
December	27.4	71	−23	0.81	0.85	0.30	4.4
January	23.1	71	−28	.70	.73	2.25	3.9
February	25.6	77	−33	1.03	1.22	.70	8.2
Winter	25.4	77	−33	2.54	2.80	3.25	16.5
March	37.1	90	−12	1.26	.50	.25	6.4
April	50.0	99	10	3.24	1.41	8.92	2.9
May	60.0	103	17	4.35	1.77	9.76	.3
Spring	49.0	103	−12	8.85	3.68	18.93	9.6
June	70.2	107	35	4.56	5.51	10.30	.0
July	73.8	110	42	4.23	1.05	9.34	.0
August	73.7	109	39	3.51	.42	2.35	.0
Summer	72.6	110	35	12.30	6.98	21.99	.0
September	65.4	104	23	2.54	2.14	2.10	.0
October	52.6	94	6	1.87	.78	.68	.7
November	38.0	82	−4	.94	.05	2.37	2.6
Fall	52.0	104	−4	5.35	2.97	5.15	3.3
Year	49.9	110	−33	29.04	16.43	49.32	29.4

The mean annual temperature is 49.9° F. The warmest months are July and August, with mean temperatures of 73.8° and 73.7°, respectively. January is the coldest month, with a mean of 23.1°. The mean temperature for the summer months is 72.6°, and for the winter 25.4°. The highest recorded temperature is 110° in July and the lowest, −33° in February.

The average date of the last killing frost in the spring is May 3, and that of the first in the fall, October 3. This gives an average growing season of 153 days, which is ample for the maturing of all crops ordinarily grown. In the 20 years from 1895 to 1914 there were five seasons in which killing frost occurred 10 or more days earlier than the average and four seasons in which it was 10 or more days later. The earliest recorded killing frost occurred on September 12 and the latest on May 27. Fruit is often injured by late spring frosts, especially when the frost follows unusually warm periods during which the fruit buds have developed.

The mean annual precipitation is 29.04 inches, of which 12.30 inches, or about 42 per cent, falls during the principal part of the growing season—June, July, and August. The precipitation in the driest year on record (1894) was 16.43 inches and in the wettest year (1879), 49.32 inches. The driest months are November, December, and January, each with less than an inch normal precipi-

tation. May, June, and July have the heaviest rainfall. In summer the rain usually comes during thundershowers and the precipitation is heavy for a short time. Torrential rains, however, are rare. Droughts seldom occur in May and June. In the latter part of July and during August, however, the rainfall is considerably lighter and less evenly distributed, and crop yields are sometimes greatly reduced from lack of moisture during these months.

The prevailing winds are from the northwest during December to March. In the spring and summer they are usually from a southerly direction. Strong winds are common, but tornadoes are rare.

AGRICULTURE

The first white men to realize the agricultural possibilities of the area now included in Kearney County were emigrants en route to the gold fields of California in the early fifties. At that time the land was thought to be valuable only for grazing, and cattlemen located around Fort Kearney and along the Oregon Trail in the northern part of the county. The cattle industry developed rapidly and flourished for several years, as the range was free and afforded an abundance of nutritious pasture grasses. During these years it was noticed that corn left in camp sites along the Oregon Trail often sprouted and grew. This induced a few settlers to grow sod corn for sale to the emigrants, and the farming possibilities of the soil became established. In 1872 and 1873 much of the land was taken up under the homestead and preemption laws, and within the next few years all the desirable land had been settled.

Sod corn was usually the first crop the settlers planted; and corn, together with game and beef, formed their chief food. As conditions became more stable, spring wheat, oats, barley, rye, and garden vegetables were grown. Fort Kearney, later called Kearney City, was the chief market for the surplus farm products.

The early agricultural development was slow. The settlers were not familiar with the local climatic and soil requirements. Their seed, brought largely from Eastern States, was not suited to the climatic conditions. Little attention was given to the preparation of the seed bed and in consequence yields were low. In the late eighties most of the crops were destroyed by the grasshoppers and in the early nineties the droughts were especially severe. Many farmers became so impoverished that they were forced to leave the country. The present tendency is to improve the crops through the careful selection of native seed, to conserve the soil moisture by intensive cultivation, and to increase the productiveness of the land by crop rotation, manuring, and the growing of some leguminous crop such as alfalfa. There is, however, much room for improvement in farming methods even now.

The following table, compiled from the reports of the Federal census, gives the acreage and production of the leading crops and shows the trend of agriculture in Kearney County for the last 40 years.

Acreage and production of leading crops in 1879, 1889, 1899, 1909, and 1919

Crop	1879		1889		1899		1909		1919	
	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production
	Acres	*Bushels*	*Acres*	*Bushels*	*Acres*	*Bushels*	*Acres*	*Bushels*	*Acres*	*Bushels*
Corn	14,032	342,760	64,671	2,772,266	90,990	2,320,600	80,385	1,429,781	66,547	2,093,900
Oats	2,032	55,631	19,498	565,269	26,278	658,730	21,962	571,692	9,096	247,456
Wheat	21,078	225,382	41,550	536,101	70,888	611,820	85,305	1,613,451	113,153	1,369,348
Rye	432	5,272	691	8,650	825	7,830	148	1,797	1,718	19,870
Barley	668	14,547	6,015	133,086	515	5,000	147	3,100	4,163	71,740
Flaxseed	------	106	1,335	12,287	123	480	8	32	------	------
Potatoes	------	29,298	1,388	136,510	1,029	97,093	759	45,436	572	27,189
		Tons		*Tons*		*Tons*		*Tons*		*Tons*
Hay (all kinds)	3,108	3,626	23,977	25,917						
Wild hay	------	------	------	------	18,260	14,447	13,667	12,264	9,827	11,485
Tame hay [1]	------	------	------	------	2,863	5,659	13,115	20,937	10,940	18,862
Alfalfa	------	------	------	------	1,563	3,547	11,762	19,095	8,640	15,003
Coarse forage	------	------	------	------	1,243	3,243	1,054	2,347	8,697	20,454

[1] Includes alfalfa.

The present agriculture of Kearney County consists of diversified farming, including the growing of grain and hay and the raising of livestock.

According to the Federal census of 1920, the principal crops are wheat, corn, wild hay, oats, alfalfa, barley, and rye, ranking in acreage in the order named. The same census reports the value of all cereals produced in Kearney County in 1919 as $6,066,823. The total value of all domestic animals was $2,660,442. Dairy products were produced to the value of $202,694, and poultry and eggs to the value of $290,811.

In 1919, the crop year reported by the census, war prices were more or less in effect and the acreage devoted to several of the crops was governed by an abnormal demand. Within a few years conditions became more normal; the acreage of wheat especially was reduced and that of corn was increased. As reported to the Nebraska Department of Agriculture, corn was the leading crop in 1923, followed by wheat, oats, barley, alfalfa, wild hay, sorgo (sweet sorghum), and Sudan grass, ranking in acreage in the order named.

In 1923, 92,272 acres were devoted to corn. The total yield was 2,768,160 bushels, or an average of 30 bushels per acre. The average yield was 10 bushels in 1921 and 17 bushels in 1922. Corn is grown on all the soils of the county except on the dunesand areas, the more sandy parts of the Valentine soils, and the poorly drained bottom lands. The highest yields are obtained on the flatter areas of Holdrege soils. The acreage devoted to corn has steadily increased since 1919. The occurrence of droughts and hot winds during July and August in some years causes considerable damage to the corn crop and reduces the production appreciably. When the rainfall is sufficient throughout the growing season, the crop does well, yielding from 25 to 40 bushels per acre.

On farms operated by owners most of the corn is fed to hogs, beef cattle, and work stock, but on tenant farms more of the corn is sold. In 1922 there were 46 silos in the county, and on farms equipped with silos from 10 to 20 acres of corn are cut each year for silage. It is common practice to husk the corn from the stand-

ing stalks in the fall and pasture the cattle and hogs in the fields during the winter. Some farmers fence off a few acres of unhusked corn for hog range, and a few husk only enough to supply their work stock, allowing the cattle for market to feed in the fields until fattened. A small acreage is annually cut for forage. On tenant farms corn is often grown on the same land several consecutive years. This method, however, results in lower yields than where it is grown in rotation with small grains and alfalfa. In recent years some attention has been given to the improvement of the seed corn by selecting the larger and better formed ears while gathering the crop. As a rule, however, seed selection is not practiced. All of the corn is of the dent varieties, though little attention is given to keeping the strains pure. Reid Yellow Dent, Iowa Silvermine, Nebraska White Prize, and mixtures of these strains are most commonly grown.

The Nebraska Department of Agriculture reports wheat on 63,988 acres in 1923, with a total yield of 442,779 bushels, or an average of about 6.9 bushels per acre. The acreage was almost twice as great in 1919. The average yield was 13 bushels in 1921 and 9 bushels in 1922. Winter wheat is grown chiefly, as it can be planted in the fall after the busy season is over. It matures earlier in the summer than spring wheat and is therefore less affected by the dry weather and hot winds. The yields of winter wheat also fluctuate less than those of spring wheat and there is less danger from smut and rust. Turkey and Kanred are the leading varieties of winter wheat. The more progressive farmers endeavor to keep the strains pure. Wheat is grown throughout the loessial uplands; it is a hard-land crop and is seldom grown on the sandy soils of the county. A binder is usually used in harvesting, though in dry seasons when the stems are too short for binding the grain is headed. The crop is shocked or stacked in the field for threshing. Wheat is the chief cash crop, and most of it is sold direct from the threshing machine.

Oats now rank next to wheat in acreage, although in 1919 the oat crop was exceeded by that of wild hay. The Nebraska Department of Agriculture reports 18,167 acres in oats in 1923, with a total yield of 545,010 bushels, or an average of 30 bushels per acre. Kherson is the leading variety. Oats are grown chiefly as a step in the rotation between corn and wheat. The crop is usually cut with a binder and either shocked or stacked for threshing. The grain is used largely as feed for horses and other stock and some is sold. Most of the straw is left in the field, and stock is given access to the stacks. It has a rather high feeding value and some is baled for shipment. A few farmers procure seed from other sections; many, however, simply clean a sufficient quantity of the previous crop for seed. The latter method is probably conducive to higher yields, as the crop becomes better adapted to the local soil and climatic conditions. Oats can be grown in all but the sandier and more poorly drained parts of the county, but the highest yields are obtained on the well drained loessial uplands.

Barley ranks next to oats in acreage. The Nebraska Department of Agriculture reports 12,179 acres in barley in 1923, with a total yield of 304,475 bushels, or about 25 bushels per acre. The crop is grown in all parts of the county except the more sandy portions and

steeper slopes. The highest yields are obtained upon the moist bottom-land soils. The grain is grown chiefly for feed, though some is sold. The crop is cut with a binder and later threshed. The straw usually remains in the field as left by the thresher, and stock is allowed to feed upon the stacks.

Among the grain crops, rye ranks next in acreage. The area devoted to this grain varies considerably, depending upon the market, and is usually exceeded by that of several hay and forage crops. In 1922, 1,489 acres were in rye, and in 1923, 733 acres, each year with an average yield of 12 bushels per acre. Rye is grown chiefly upon the loessial upland soils, usually for the grain, but to some extent for hay and pasture. It is more drought resistant than either wheat or barley and will flourish on soils of a more impoverished nature. The crop is harvested in the same manner as wheat and oats. Most of the rye is fed to stock on the farms, though some is sold. Many farmers seed a small patch of rye for pasture early in the fall.

Alfalfa has the leading acreage among the hay and forage crops. It occupied 8,548 acres in 1923, with an average yield of 2.5 tons per acre. The crop does best upon the Holdrege and Colby soils. The latter are especially well adapted to alfalfa on account of their high lime content. Alfalfa does fairly well upon the Grundy soils in normal seasons, but in dry years the heavy compact subsoil prevents a sufficiently free upward movement of water for best results. The crop does not do well on the extremely sandy soils of the county on account of their low lime content. From two to four cuttings are obtained, depending upon the rainfall. During average years the crop is cut three times. Alfalfa is generally stacked in the field and hauled to the feed lots as needed. It is used as feed for cattle and hogs. Hogs are often allowed to run in the fields during the summer, though cattle are seldom grazed on green alfalfa on account of the danger of bloating. The crop is an excellent one for building up depleted soils and should be used in the rotation as often as possible. It is good practice to plan the rotation of crops so that alfalfa remains on at least 10 per cent of the farming land.

In 1923 wild hay was cut from 9,256 acres, yielding 11,107 tons. Hay is cut chiefly upon the poorly drained bottom lands and upon the sandy soils of the Valentine series. The highest yields are obtained from the bottom lands. The upland hay, however, is less rank and has a higher feeding value. Practically all of the hay is fed to work stock and cattle. The greater part is stacked in the fields and hauled to the feed lots as needed, though some is mowed away in the barns.

Sudan grass was grown on 1,936 acres in 1923, with a total yield of 4,453 tons, or 2.3 tons per acre. The crop is adapted to all the soils of the county except the most poorly drained portions of the flood plains and the extremely sandy lands of the Valentine series and dunesand. It is very hardy, produces well, and will stand considerable dry weather.

The Nebraska Department of Agriculture reports 2,948 acres in sorgo (sweet sorghum) in 1923. The average yield was 3 tons per acre. Some sirup is made annually, but most of the sorgo is used as feed for cattle and horses. The crop is usually cut with a mower

or binder and either shocked in the field or stacked near the feed lots. Part of the crop is threshed for seed.

Among the minor crops, millet, sweet clover, kafir, and potatoes are the most important. They are grown in small patches for feed and home consumption..

There are no commercial orchards in the county. Many farms have a few apple, plum, peach, and cherry trees, but the local demand for fruit is not supplied. Very little wild fruit grows in Kearney County.

The livestock industry affords an important source of revenue. The Federal census reports 23,577 cattle in the county in 1920; 16,556 of these were classed as beef cattle. The total value of all cattle is given as $1,127,962. The quality of the beef cattle is very good. Most of the herds are of grade Hereford or Shorthorn breeding, headed by a purebred bull. There are 62,802 acres of pasture land in the county, and many farmers purchase stock for summer grazing. The cattle are usually fattened on corn and alfalfa after coming off the summer range, and are shipped to Omaha. A few farmers annually ship in a carload or two of cattle for winter feeding.

Dairying receives little attention. There are no farms devoted entirely to the dairy industry. Nearly every farmer, however, milks a few cows, chiefly of mixed beef and dairy breeds, and sells the surplus dairy products in the local markets.

Hogs are raised on nearly every farm except those in the most sandy parts of the county where the land is suitable only for grazing. A few farmers have large herds. The Federal census reports 28,071 hogs in the county in 1920, with a total value of $589,531. Duroc-Jersey, Poland-China, and Hampshire are the leading breeds. A few farmers have purebred herds, though most of the animals are grade stock. The hogs are fattened on corn and alfalfa, either in feed yards or by being allowed to run in the fields. On a few farms the hogs are fed on corn wasted by fattening cattle. During past years hog cholera has been a serious menace to the hog-raising industry, but vaccination and sanitation have largely eliminated this disease.

Sheep raising receives little attention, and there are only a few small flocks of sheep in the county. Some farmers buy a carload or more of sheep in the fall, fatten them on corn and pasturage, and sell them when the prices are favorable. The Federal census reports 3,975 sheep, valued at $38,643, in the county in 1920.

Horse raising is for the most part confined to the raising of colts of work mares, although a few of the ranchers on the sandy lands of the county have herds of 50 to 60 horses. Much improvement in horses has been made since the introduction of purebred sires. Most of the horses are now of the medium to heavy draft types. The Percheron is the leading breed. A few mules are raised, but the local demand for these animals exceeds the supply. The census reports 8,883 horses, valued at $787,931, and 1,053 mules, valued at $114,197, in the county in 1920.

Poultry is kept on all farms and constitutes an important source of farm income. The local demand for poultry products is usually good, and the poultry is receiving increased attention. The Ply-

mouth Rock, Leghorn, and Rhode Island Red are the principal breeds. Ducks, geese, turkeys, and guinea fowls are raised on a few farms. The census reports 124,923 chickens and 2,839 other poultry in the county in 1920, with a total value of $105,082.

The staple crops are grown on all the different soil types of the county except the sandy soils of the Valentine series and dunesand and the most poorly drained parts of the flood plains. The conditions in these localities make the growing of crops difficult, and the farming activities are confined largely to cattle grazing and hay production. In general the Holdrege soils are considered best for farming. The Colby soils are known to be well adapted to alfalfa. Small grains do best upon the heavy upland and terrace soils. Although the above crop adaptations are recognized, there is not sufficient variation in the yields to cause specialized farming in any part of the county, except those areas adapted only to grazing and hay production.

Systematic crop rotation is not practiced, although the more progressive farmers have evolved more or less indefinite systems of rotation and change the crops with reasonable regularity. On tenant farms the land is often used for the same crop several consecutive years. When alfalfa sod is broken the land is often used for corn two years, oats one year, wheat one or two years, and back to corn. Corn is probably better adapted to recently broken alfalfa ground than small grain on account of its deeper rooting system, but even this crop is subject to injury from drought during dry seasons, as the alfalfa plant requires considerable moisture and leaves the ground in a rather dry condition. A rotation which appears to have merit is two years of corn, one year of oats, rye, or barley, two years of wheat, and four to six years of alfalfa or sweet clover. Under the prevailing conditions crop rotation is governed more by the relative demand and price of the grain products than by the requirements of the soil.

Only moderate attention is given to the proper preparation of the soil. Wheat land is usually plowed in the fall just before seeding time and the soil is seldom properly aerated or compacted before the grain is planted. A press drill is generally used in planting wheat. Some wheat is drilled between the corn rows in the fall, but where small grain follows corn the land is more often plowed, disked, and harrowed before planting.

Most of the corn is listed in, a one-row lister being commonly used. A few farmers prefer to plant the corn in checkrows, as the crop can be cultivated in two directions and is more easily kept free from weeds. When corn follows a crop of corn that was not cut for fodder or silage, the stalks are broken down with a stalk cutter and the field is disked before plowing or listing.

Oats, rye, and barley are planted in the same manner as wheat, except that the seed is usually drilled in as early in the spring as the condition of the soil permits.

The sandy farming soils of the county are seldom plowed more often than once in three or four years, as annual disking maintains the land in good tilth.

Sorgo and Sudan grass are either sown broadcast or planted with a drill on land that has been previously plowed and harrowed.

Most of the alfalfa is sown broadcast on a smooth, mellow seed bed and the seed covered with a harrow. This crop does best if sown immediately after the first good rain in early August. The usual rate of seeding is from 12 to 15 pounds of seed per acre.

Practically no commercial fertilizer is used, and the supply of barnyard manure is seldom adequate for best results. Little care is taken to preserve the manure. Most of it is piled out of doors without protection and by the time it is hauled to the fields much of its fertilizing value has been lost through leaching. The more progressive farmers haul the manure direct from the barns or feed lots to the fields, applying it mainly to the corn and wheat land. On tenant farms the land in the immediate vicinity of the barnyards usually receives most of the manure regardless of its needs.

Farm improvements are generally good and practically all farms are equipped with modern labor-saving machinery. Most of the fences are of barbed wire, although considerable hog-tight woven-wire fencing is used around the feed lots and alfalfa fields. The buildings are generally painted and kept in good repair. Four-horse teams are commonly used in performing the farm work. The work animals consist of medium to heavy draft horses and mules. A few tractors are used during the plowing season. According to the Nebraska Department of Agriculture there were 313 gas engines, 130 gas tractors, 33 trucks, and 1,071 automobiles on the farms in 1922. Only the more expensive farm machinery is sheltered.

Farm laborers are not easily obtained, especially during the busy season, and a few farmers hire men by the year in order to guard against lack of help at critical periods. Wages range from $40 to $45 a month with board and room. Day laborers receive $2.50 to $3 a day. During the last season (1923) corn shuckers received 6 to 8 cents a bushel, depending upon the yield. Wheat was threshed for 7 cents a bushel and oats for 4½ cents.

According to the Federal census the number of farms in Kearney County increased from 1,089 in 1880 to 1,509 in 1900. By 1920, however, the number had decreased to 1,306. The average size of the farms has increased, being 160 acres in 1880 and 236.4 acres in 1920. Most of the farms range in size from 160 to 320 acres, although there are a few holdings of over 1,000 acres. The proportion of the county in farms increased from 52.6 per cent in 1880 to 93.5 per cent in 1920, and the proportion of improved land in farms increased from 36.5 to 83.2 per cent.

The average value of all farm property per farm, including land, buildings, machinery, and domestic animals, as reported by the Federal census, was $1,347 in 1879, $4,154 in 1889, $5,824 in 1899, $19,498 in 1909, and $28,575 in 1919.

In the last 40 years the proportion of the farms operated by the owners has greatly decreased. In 1880, 94.2 per cent of the total number, and in 1920 only 46 per cent of the farms were operated by the owners. The owners occupied 601 farms, tenants 702, and managers were on 3 farms in 1920.

The share-rental system predominates in Kearney County. According to the Nebraska Department of Agriculture, 72.6 per cent of the rented land was on the share basis in 1922. Under this system the tenant furnishes all equipment, labor, and seed and receives

three-fifths to two-thirds of the crops. He usually pays $3 an acre cash rent for the pasture land. On farms rented for cash, the tenant pays $4 to $5 an acre for the strictly farming land and $3 an acre for pasture. On a few farms the renter is given the use of the pasture land without charge.

The price of land ranges from about $10 to $175 an acre, depending upon the topography, drainage, character of the soil, improvements, and location with respect to markets. The average price for the entire county is about $90 an acre. The best loessial uplands sell for $100 to $175 an acre. The dunesand and the soils of the Valentine series sell for $15 to $45 an acre, depending largely upon topography. The lowest-priced land includes small areas of extremely sandy and poorly drained soil along the Platte River.

SOILS

The discussion of the soils of Kearney County in the first part of this chapter is more or less technical and will be of interest mainly to workers in soil science. In subsequent pages under the different type headings, the individual soil types are described more from the viewpoint of their use in agriculture.

The soils of Kearney County owe their most striking and important characteristics to the forces of weathering, including the processes of leaching, oxidation, and aeration, and the character of the parent material is thought to be of minor importance. The influence of the parent material, however, is by no means negligible, as certain features can be explained only by a knowledge of the composition of the rocks from which the soils have developed. The soil-forming processes do not everywhere act with equal intensity, as local differences in topography and drainage naturally produce variations in the degree of weathering to which the soils are subjected.

The county is in a region where the climatic conditions have favored a luxuriant growth of prairie grasses and the maximum accumulation of well-decomposed organic matter. All of the soils, therefore, except those upon the most recent alluvial deposits, the wind-blown and more or less unstable sandy deposits, and the material recently exposed through erosion, have dark-colored surface horizons. The darkness of the color varies from place to place. The darkest soils naturally occur upon the flatter areas where there is a minimum of erosion.

The county lies in that soil region where the rainfall is moderate and the leaching of carbonates has seldom extended to great depths, consequently in most of the mature soils there is actually an accumulation of lime at some horizon within the soil profile. The depth of this horizon in a given locality is determined largely by the topography, drainage, age of the soil, and to a less extent by the character of the parent material from which the soil has weathered. The carbonate zone usually lies within 3 feet of the surface in the rolling uplands and well-drained terraces where there is a minimum of underdrainage. On the more nearly level upland soils and throughout the areas of porous sandy deposits, both upon the uplands and terraces, surface drainage has been restricted, and much of the surplus moisture has been forced to seek outlet through sub-

terranean channels, thereby removing the soluble carbonates to considerable depth.

On the uplands of the county the predominant soils are members of the Holdrege series. The soil profiles vary slightly from place to place, but only in the thicknesses of the various layers. In all cases the profiles of the various members of the series are similar in number of layers and physical characteristics of each stratum. The distinguishing characteristics of the Holdrege soils may be described as follows: (1) A surface or upper layer consisting of very dark-brown material, very friable and finely granular, and about 8 inches deep. The granules are roundish in shape and are very small, smaller than the head of a pin. The dark color penetrates each structure particle, so that the material when crushed is colored practically the same as the outside of the particles. In areas that have not been plowed, a well defined, horizontal splitting of the material into thin laminæ is noticeable in the dry soil, though it is often obscured by the grass roots. Where there has been no accumulation of material by wind action, this surface layer is about 8 inches thick, and is underlain by a (2) layer of very marked granulation. The granules are subangular to roundish in shape and vary from about one-eighth to one-fourth of an inch in diameter. The color of the outside of the granules is a very dark brown, essentially the same as that of the material constituting the surface-soil layer. This is especially true of the upper half of this second layer, the lower part being somewhat less dark in color. The dark color is due to a coating around the particles, the coating being thicker in the upper than in the lower part of the subsoil. Thus the color of the material composing the upper part of the subsoil, when crushed or powdered, is dark brown; but in the lower part the color is brown. This applies also to the color of a cut, as compared with a broken surface, in both the upper and lower parts of the subsoil. The granules are somewhat larger in the lower part of the subsoil, indicating a gradual transition from the subsoil to the deeper substratum. This second or subsoil layer contains a somewhat higher percentage of clay than the surface layer, and on drying it cracks vertically into roughly shaped columns from 3 to 5 or 6 inches in diameter. These columns do not retain their form when disturbed, because of the extreme friability of the soil material. The subsoil extends from a depth of about 8 inches to about 2 feet, and is underlain by a (3) stratum the material which becomes, with depth, lighter in color owing to a thinning of the dark-colored coating on the outside of the structure particles. Here the particles are larger than those in the layer above, and the columnar breakage is well defined. The columns break readily into particles about half an inch in diameter, each colored dark brown without but yellowish brown inside. The material, when crushed or powdered, is yellowish brown, with a faint grayish shade in the lower part of the layer. Each particle may be crushed readily by the fingers. Running throughout the mass are a few small burrows—presumably those of insects—from one-fourth to nearly 1 inch in diameter, each filled with material usually different in color from the main soil mass. It may consist of dark-colored material from the upper strata or of yellowish material

from the lower layer. This third stratum lies between the depths of about 24 and 32 inches, being really a transition zone. (4) Below a depth of about 32 inches is a fourth layer of yellowish to grayish-yellow material which breaks into rather indefinite particles, larger and less regular in form than those in the layer above. These particles are coated with a material having a rather brown color. The texture of this material is somewhat lighter than that of layer number 2 or 3. A great many tubes or borings, presumably of insects, penetrate the mass in all directions. Some of these borings are filled with dark-colored material; and a greater number, with lighter-colored material. In the lower part of this fourth layer, the material does not break into definite structure bodies or particles. This stratum occupies a position between depths of about 32 and 40 inches, and is underlain by (5) a fifth layer consisting of yellowish-brown, friable, silty, structureless material, free from carbonate of lime. This layer, at a depth of about 46 inches, is underlain by (6) a sixth stratum of material similar to that of the fifth layer, except that it contains carbonate of lime. In Kearney County Holdrege silt loam, including a basin phase, and Holdrege very fine sandy loam are mapped.

A group of upland soils less prevalent than those of the Holdrege series are the Grundy soils, which occur on very flat and slightly depressed areas. The common characteristics of these soils may be described as follows: The first and second soil layers are like the corresponding ones of the Holdrege soils; but the third layer is very different, thus distinguishing these soils from the others. This third stratum consists of very hard clay, which breaks into well defined columns on drying. The columns, in turn, are made up of a mass of angular particles about half an inch in diameter, each, when dry, constituting a body of almost stonelike hardness; and when wet, the tenacity of the heavy clay prevents the ready breakage of these columns into the separate particles. Each individual particle, on the outside, is dense black to very dark brown in color, and on the inside it is usually very dark brown. At a depth of about 36 inches this third layer is underlain by a heavy, black material having a columnar breakage. The columns, in turn, break into particles, some as large as an inch in diameter. The particles are angular, irregularly shaped, and have a dark-brown color on the outside, but a yellowish-gray color on the inside, especially in the lower part of the stratum. This layer occupies a position between depths of about 36 and 45 inches, and is underlain by a fifth layer of grayish-yellow, silty, friable material, which contains a great many soft accumulations of lime carbonate. This material breaks less definitely into vertical columns, and the particles are somewhat dark colored. Deeper down is a sixth layer consisting of yellowish-gray, silty material, exactly like that beneath the Holdrege soils. It contains carbonate of lime, but none in the form of concretions, either hard or soft. The silt loam of the Grundy series is mapped in this county.

Associated with the Holdrege soils are extensive areas throughout the uplands in which there is no great accumulation of organic matter on the surface of the parent silty materials. Such soils are classed with the Colby series. They have light-brown to gray surface layers and the subsoil is a yellowish-gray or almost white, loose,

floury silt, similar in character to the parent material from which the soil has weathered. Such soils occur on comparatively level flats; the drainage is mostly subterranean, and the carbonates have largely been leached from the surface and upper subsoil layers. This condition is unusual, as the Colby soils of Nebraska generally occur in the more hilly and dissected parts of the uplands, where erosion has not permitted leaching of the carbonates so fast as new material has been brought near the surface, so that lime is usually abundant throughout the entire subsoil, and even the surface soil is often highly calcareous. In Kearney County most of the Colby soils occupy what is thought to be an old flat meander channel of the Platte River when that stream was flowing only slightly below the level of the present uplands. Such a conclusion is favored by the physiography and relative elevations of the region, and probably accounts for the removal of most of the organic matter from the surface layers. The level topography has favored the leaching of the soluble carbonates to greater depths than is usual in areas where the run-off is more rapid. In any event, the Colby soils represent the least mature stage of development of any of the silty soils in Kearney County. Sufficient time has not elapsed for the accumulation of enough organic matter to darken the surface, although conditions are now favorable for the growth and decay of plant life.

The silty soils of a fourth group have weathered under conditions of poor drainage. They occupy depressions in the uplands where the surplus moisture accumulates after rains. The surface layers are dark brown to black and very deep. They usually have the silty texture and granular structure of the typical prairie soils. The subsoil is a dark-brown to gray, sometimes mottled, heavy clay which often continues below 3 feet. It is heaviest and most compact in the lower and more poorly drained parts of the depressions, becoming gradually less dense toward the margins. The compact nature and dark color is due in part to organic matter and silt and clay which had been carried down from the topsoil and concentrated in the subsoil. Alkali salts have also probably aided in producing the compact structure in the subsoil. Continued leaching has removed most of the soluble carbonates to depths below 3 feet. The soils in Kearney County having these characteristics are classed with the Scott series. They occupy the deeper and more poorly drained parts of depressions. The poor drainage has favored a rapid accumulation of organic matter in the surface layers and has retarded aeration and oxidation.

Topography and drainage, the same agencies which have caused variations in the degree and manner of weathering of the silty parent materials and produced from them several distinct groups of soils, have also affected the sand deposits of Kearney County to some extent. The sands, however, are of more recent origin and less stable nature than the silts, and the character of the soils derived from them is governed to a larger extent by the relative time they have remained in their present positions undisturbed by stream erosion or wind action. Their loose porous nature has favored excessive leaching and they have not retained any large amount of carbonates. Dunesand is wind-blown material which by reason of its recent deposition and its porous, leachy nature has accumulated

very little organic matter. The material is light gray and loose, and extends to great depths with little change. It has been whipped by the wind into hills and ridges from 30 to 60 feet high.

The soils included with the Valentine and Sparta series represent a slightly more advanced stage of weathering than dunesand. The material has become more stable, the topography is more nearly level, and conditions have favored the accumulation of a small amount of organic matter in the surface layers. The subsoil, however, consists of the loose, incoherent parent sand.

The O'Neill soils represent the most advanced stage of weathering in soils derived from sand in this county. The topography is flat to very gently undulating. The sands have remained in their present position undisturbed by wind action or stream erosion for considerable time, and have accumulated large amounts of organic matter in their surface layers. The subsoil, however, is not so well supplied, and the unweathered parent sand is nowhere more than 2 feet below the surface.

The poorly drained sandy soils are classed with the Cass and Sarpy series. They occupy first-bottom or flood-plain positions, and the moisture supply is exceptionally favorable for the growth and decay of plants. The Cass soils have accumulated large quantities of organic matter in the surface layer of 6 or 8 inches, and the soil is dark brown to black in color. The soils of the Sarpy series are of more recent origin and sufficient time has not elapsed for the accumulation of enough organic matter to darken the surface soil.

The origin of the parent materials from which the soils of Kearney County are derived is not clearly understood. The siltlike material is known by geologists as loess. It is thought to represent finely ground rock powder deposited as a smooth, thick mantle of outwash from one or more of the melting ice sheets during glacial times. It consists very largely of silt, with a small percentage of very fine sand and some clay. It has a loose, fine texture and floury character and varies in color from pale yellow to yellow or light gray. Lime is abundant and a small percentage of iron often stains the material.

The sand in the northern part of Kearney County is thought to have been originally released from sandy formations to the west and from coarse material within or under the loessial mantle. Much of it has evidently been transported as sediments by the Platte River. Part of this sediment was deposited on the old and present flood plains during periods of high water, and part has been blown out upon the uplands from the river channel during low stages of the stream.

The local developments of sand in the eastern part of the county are probably from coarse-textured deposits within or under the loessial mantle. There is some evidence, however, of their having been blown from an old Platte River terrace. All the sands of Kearney County have been so shifted about and reassorted by wind and water as to greatly obscure their origin. They are light gray or light brown in color and consist chiefly of a loose incoherent mass of angular or slightly rounded quartz and feldspar grains. Any soluble carbonates which they may have contained were probably largely removed prior to their deposition.

The surface exposures of the sand and loess deposits have undergone marked changes in color, structure, and composition and also chemical and physical changes such as the concentration of clay in the subsoil and the partial or entire removal of the soil carbonates. These changes, which have been produced by the various degrees of weathering and by the growth and decay of plant life, have altered the surface of the parent materials from their raw state into the present stages of soil development and have produced groups of soils having similar characteristics. The soils have been separated into soil series on the basis of similarity in color, subsoil, topography, drainage, and origin. Each series consists of soil types that differ in the texture or the relative percentages of different sized particles in the surface soil. Ten soil series are represented in Kearney County. Nineteen types or phases of types are mapped, including dunesand, which is miscellaneous material not classed with any soil series.

The types included with the Colby series have brown to ashy-gray surface soils which usually pass abruptly into light-yellowish or almost white, high calcareous subsoils. They have weathered from loess and have an open structure and silty texture. The soils occupy upland positions, and the topography generally varies from sharply rolling to rough and dissected. In this county, however, they are mainly on comparatively level land. The Colby silt loam, very fine sandy loam, fine sandy loam, and loamy sand are mapped.

The Valentine series consists of types with brown to grayish-brown surface soils. The subsoil is light-brown to gray, loose, incoherent sand. The surface layers contain small amounts of organic matter and clay which give some of them a loamy texture. The soils are low in lime. They are developed upon wind-blown sands which have become stable. The topography varies from choppy and hummocky to almost level. Drainage is usually excessive. Surface channels are not developed, but moisture seeps downward through the loose, porous subsoil. Only one type, the Valentine sand, occurs in this county.

The surface soils of types of the Scott series are dark brown to almost black and the subsoil is dark-gray or olive-drab, stiff, impervious clay. Locally there is a thin layer of ashy-gray silt between the surface and subsoil layers. The types occur in shallow basins scattered over the more level parts of the loessial uplands and terraces. As these areas have no outlet, water collects in them after rains. The Scott silt loam is mapped in Kearney County.

The Hall series includes types with dark-brown to black surface soils, underlain by a brown, slightly compact upper subsoil which at a depth of 18 inches usually passes abruptly into a brown, compact silty clay. Below 24 to 30 inches the material is a gray or yellowish-gray, loose floury silt which is highly calcareous. In this county the extremely compact layer has not developed in the subsoil, and the profile is similar to that of the Holdrege soils. These soils occur on high terraces that are at present well drained. The topography is flat to very gently undulating. One type, the Hall silt loam, is mapped.

The Sparta series has light-brown to brown surface soils, underlain by light-gray, sandy or gravelly subsoils. The soils are formed by the partial weathering of stream-deposited sand and gravel and

occupy flat to gently undulating terrace positions. Drainage is thorough and in many places excessive, owing to the porous nature of the soil material. The types are usually low in lime. The Sparta sand and gravelly sandy loam are mapped in this county.

The O'Neill series consists of types with brown to dark-brown surface soils and a light-brown, loose, incoherent subsoil. They are the result of water deposition and occupy flat to gently undulating terrace positions. Underdrainage is usually excessive, and the soils have not retained any large amounts of carbonates. The O'Neill sandy loam is mapped.

The Cass series includes dark-brown to black soils, underlain by a gray sandy subsoil which frequently passes into coarse sand and gravel below 30 inches. These types occupy first-bottom or flood-plain positions. The soils have weathered from sandy alluvial deposits. They are usually low in lime. Three types—the Cass very fine sandy loam, fine sandy loam, and loamy fine sand—are recognized.

The soils of the Sarpy series have brown to light-brown surface layers, underlain by light-colored, incoherent, sandy, or gravelly subsoils. The types are low in lime. They occupy first bottoms along streams. The soils represent a less mature stage of weathering than those of the Cass series and have not accumulated much organic matter in the surface layers. They are similar to the Sparta soils in texture and color, but occupy lower positions and are more poorly drained. The Sarpy sand is mapped in this area.

In the following pages the different soil types are described in detail and their relation to agriculture is discussed. The accompanying map shows their distribution in the county. The table below gives the acreage and proportionate extent of the soils mapped:

Areas of different soils

Soil	Acres	Per cent	Soil	Acres	Per cent
Holdrege silt loam	113,600	35.5	Scott silt loam	3,584	1.1
Basin phase	3,456		Sparta sand	3,328	1.0
Grundy silt loam	51,328	15.5	Colby loamy sand	2,688	.8
Colby silt loam	28,672	8.7	O'Neill sandy loam	1,920	.6
Colby fine sandy loam	24,256	7.3	Cass very fine sandy loam	1,216	.4
Colby very fine sandy loam	21,056	6.4	Hall silt loam	1,088	.3
Dunesand	20,736	6.3	Sarpy sand	640	.2
Valentine sand	18,496	5.6	Cass loamy fine sand	576	.1
Cass fine sandy loam	16,384	5.0			
Sparta gravelly sandy loam	10,048	3.0	Total	330,240	
Holdrege very fine sandy loam	7,168	2.2			

GRUNDY SILT LOAM

The surface soil of the Grundy silt loam is a very dark-gray to almost black mellow silt loam to an average depth of 10 inches. It is underlain by a layer of 10 to 14 inches of heavy compact clay or silty clay of brown to brownish-gray color. This layer is tough and impervious and resembles a hardpan in physical characteristics. The lower subsoil is a gray to light-gray, moderately compact silty clay, which gradually becomes lighter in both color and texture with depth and below 3

feet resembles the light-gray to almost white silty subsoil of the Holdrege series. The surface soil is rich in organic matter and has a velvety feel. The transition between the different soil horizons is rather abrupt, both in color and structure. The difference in structure is very noticeable in old excavations, and along road cuts, where the surface horizon has a loose granular structure, the upper subsoil appears heavy and compact and contains numerous small seams and checks due to the shrinkage of the clay, and the lower subsoil and substratum have the vertical or columnar structure so characteristic of the original loessial deposit from which the soil has weathered. The type is not highly calcareous within the 3-foot depth, but below 40 inches the substratum will usually effervesce with dilute hydrochloric acid. The organic matter content gradually decreases with depth, but is seldom deficient in the upper 2 feet of soil.

Numerous variations from the typical material occur throughout the areas of the type. They are, however, either of small extent or unimportant from an agricultural viewpoint and do not warrant separation on the soil map. In places on the flatter areas the surface soil is much deeper than usual. In these localities the dark-brown to black upper horizon often extends to 18 or 20 inches, and the heavy hardpanlike layer usually continues below 3 feet before the light-colored and more friable substratum appears.

Locally throughout the type, and especially in the vicinity of areas of Scott silt loam, the subsoil is slightly mottled with gray and rusty-brown splotches due to poor internal drainage.

In the more undulating areas the compact subsoil horizon is much thinner than usual, varying in thickness from 4 to 6 inches, and locally upon narrow ridges and around drainage ways it is entirely absent. Where such areas are of sufficient size to warrant mapping they are shown as Holdrege silt loam. The Grundy and Holdrege silt loams in Kearney County differ chiefly in that the upper subsoil of the former has a decidedly heavy, compact, and hardpanlike structure, whereas that of the latter is more friable and usually slightly lighter in color. The two soils, however, merge so gradually into each other that it is almost impossible accurately to separate them. Small areas of Holdrege silt loam are included with the Grundy soil, and vice versa. Narrow strips of colluvial material too small to show on the map are encountered along drainage ways throughout the type.

The Grundy silt loam is extensively developed in Kearney County. It is the dominant soil between Minden, Axtell, and Keene in the southwestern part and occupies a considerable area around Osco Church in the southeastern part. Smaller bodies occur scattered throughout the southern half of the county.

The Grundy silt loam has weathered from the fine-textured loessial deposits which underlie most of the county. Restricted drainage has been unfavorable for surface washing, but has produced a downward movement of the finer particles from the surface soil. This fine material has accumulated in the lower soil horizons, creating the compact clay-pan layer so characteristic of the type.

The topography is nearly level to very gently undulating. It is locally modified by low, flat-topped ridges, shallow valleys, and slight depressions.

Practically all of the type at present has adequate drainage for crop production. There is usually sufficient slope, except in a few local depressions, to carry off the moderate rainfall of the region, and crops seldom suffer from excess moisture. In dry years the compact subsoil layer prevents a sufficiently free upward movement of moisture for best results, and during prolonged droughts crop yields are sometimes greatly reduced.

The Grundy silt loam is an important agricultural soil in Kearney County. It is less extensive and has a slightly less favorable moisture supply than the Holdrege silt loam, but its level topography and high fertility tend to make it a valuable type for general farming. Originally it supported a luxuriant growth of pasture grasses, including grama grass, big and little bluestem, wheat grass, and buffalo grass. Practically all of the native sod has been broken for crop production, except narrow strips along country roads and local patches used for pastures.

Wheat, corn, oats, and rye are the principal cultivated crops, ranking in acreage in the order named. Small fields of barley, millet, sorgo, Sudan grass, and alfalfa are grown for feed. The land seems better adapted to small grains than to corn and alfalfa, probably because the grains mature early in the summer, while the soil above the heavy compact horizon still contains much of the moisture accumulated during the fall and winter. Crop yields are governed largely by the precipitation and the condition of the soil. The average yield of wheat is about 14 bushels, corn 25 bushels, oats about the same as corn, and rye 18 bushels per acre.

Winter wheat is the main cash crop and is usually sold in the local elevators soon after harvesting. Most of the corn, oats, rye, barley, and alfalfa are fed on the farms or sold to local feeders. The raising of hogs is an important industry. Cattle grazing is not practiced extensively on account of the limited pasture. Many farmers, however, ship in stock for winter fattening.

The soil of the Grundy silt loam is very easily handled. Its smooth topography, silty texture, and stone-free character are favorable to cultivation. It is rather heavy and has a tendency to clod if plowed when wet, but the lumps are easily reduced. Strong machinery and heavy draft animals are required for best results. A few tractors are used on the type.

Land to be used for wheat or rye is usually plowed in the middle or late summer and seeded in the early fall with a press drill. Some wheat is drilled in between the corn rows before the corn is gathered. Corn is planted either in checkrows or by listing; the latter method requires less labor and is practiced chiefly on tenant farms. Oats are drilled in during April or early May. Commercial fertilizers have never been used in growing the staple crops. Barnyard manure is applied when available, but the supply is seldom sufficient to produce a noticeable increase in the total crop yields. Crop rotation is not systematically practiced, and many fields have remained in wheat 4 to 6 consecutive years.

The Grundy silt loam in Kearney County sells for $125 to $175 an acre, depending upon improvements and location with respect to markets.

The soil of this type is naturally strong and fertile and endures severe cropping to one grain. This practice, however, is injurious

to the soil and will cause reduced yields of all crops. It is much easier and less expensive to maintain the present fertility than to restore it when weakened. Crops should be frequently changed and alfalfa or some other legume brought into the rotation as often as possible. Deeper plowing is beneficial and is needed on most farms.

HOLDREGE VERY FINE SANDY LOAM

The surface soil of the Holdrege very fine sandy loam is a dark grayish-brown to brown very fine sandy loam, 10 to 14 inches deep, and loose and friable. The surface layer of 6 or 8 inches contains much organic matter, which accounts for the dark color. The transition from the soil to the upper subsoil is very gradual. The latter is a grayish-brown, slightly more compact, very fine sandy loam, and contains more silt and clay than the surface horizon. The color gradually becomes lighter with depth, and below 24 or 30 inches the material grades into the loose, floury, calcareous silt of the parent loess. Lime concretions are abundant in the lower subsoil.

The type is not uniform throughout the area of its occurrence in Kearney County and varies considerably in the color, depth, and texture of the surface soil. On the more level areas and gradual slopes, where conditions have favored deep soil weathering and the accumulation of organic matter, the soil is in places almost black and 12 to 16 inches deep. Around the margins of the type where it borders areas of Colby soils, the depth of the surface layer containing large amounts of organic matter decreases, and in places it is difficult to locate accurately the boundaries between the two types. Locally the surface soil contains so much sand of coarser grades as to approach a fine sandy loam in texture.

The Holdrege very fine sandy loam occupies a few small bodies in the central, east-central, south-central, and southeastern parts of the county. The soil has been derived through weathering from loessial deposits. It is in reality Holdrege silt loam, the surface of which has been so intermixed with transported sands that it has assumed a very fine sandy loam texture.

The topography ranges from flat to rolling, the greater part being gently rolling. Drainage is everywhere free; it is excessive only on the steeper slopes. Usually there is sufficient slope even on the flatter areas to carry off the surplus moisture, and the porous subsoil affords ample underdrainage.

Owing to its small extent, the type is not an important agricultural soil in Kearney County. It is naturally strong and fertile, however, and ranks with the Holdredge silt loam in crop production. It can be tilled under a somewhat wider range of moisture conditions. The soil is very stable, as the large content of organic matter prevents excessive wind erosion even in the driest years. All crops do well in seasons of normal precipitation.

The native vegetation consists of the same grasses as are found on the Holdrege silt loam. Only about 10 per cent of the original sod remains. The greater part of the type is used in the production of corn, oats, wheat, and alfalfa. A few farmers feed cattle during the winter, and hogs are raised for market on every farm.

The yields of all crops and the method of handling the land are about the same as on the Holdrege silt loam. The loose, porous soil lends itself admirably to the formation of a surface mulch, and the type is probably slightly more retentive of moisture than even the silt loam. It is also somewhat easier to handle and can be cultivated with less power and lighter machinery. The land sells for $90 to $150 an acre.

HOLDREGE SILT LOAM

The surface layer of 6 to 18 inches of the Holdrege silt loam consists of a very dark grayish-brown to almost black, mellow silt loam containing only a small percentage of very fine sand. It is rich in organic matter and has a smooth velvety feel. The transition between the soil and subsoil horizons is rather abrupt. The upper subsoil is a gray to light-gray silt loam slightly more compact than the surface soil, although it seldom attains the hardpan character of the corresponding layer in the Grundy silt loam. The lower subsoil is a light-gray to yellowish-gray, smooth silt or silty clay. It is mottled locally with white splotches and usually contains angular lime concretions below the 30-inch level. The lime content of the subsoil, however, is variable, and in the flatter areas of the type it is often very low within 3 feet of the surface. The entire subsoil, although loose and friable in its natural condition, becomes rather hard and brittle when dry, owing to its large clay content. The substratum below 36 inches merges gradually with the underlying parent loess from which the soil has weathered. The content of organic matter decreases with depth and only slight traces occur below 30 inches. The structure of the soil and upper subsoil is open and granular whereas that of the lower subsoil and substratum is columnar.

The type as mapped in Kearney County includes several minor variations which are of small extent and local importance and do not warrant separation on the soil map. In the more rolling parts of the type and in the vicinity of areas of Colby soils the surface layer is lighter colored and much thinner than usual, owing to rather extensive erosion. The soil in these localities is a brown to grayish-brown silt loam 6 to 8 inches deep, underlain by the light-gray or almost white, floury, calcareous silt of the parent loess. Upon the steeper valley slopes erosion has entirely removed the dark-colored surface soil, exposing the light-gray calcareous subsoil. Where such areas are large enough to warrant mapping, they are included with the Colby soils. The Holdrege and Colby silt loams differ mainly in that the former has accumulated more organic matter in its surface horizon and is darker in color.

Upon the more level areas and around the margins of the type where it borders bodies of Grundy silt loam, the upper subsoil is considerably more compact than usual, in places approaching that of the Grundy type. These two soils differ widely in subsoil characteristics where typically developed. In this county, however, their boundaries sometimes merge so gradually that they are extremely difficult to separate. In Kearney County the Holdrege silt loam was confined to those areas in which the upper subsoil was rather friable or contained less than 2 inches of a decidedly compact stra-

tum. It is possible that small areas of Grundy soils are included with the Holdrege silt loam, and vice versa.

Locally the surface soil of the Holdrege silt loam contains so much sandy material as to approach a very fine sandy loam in texture, and small areas of Holdrege very fine sandy loam are included with the type.

Scattered throughout the type are numerous poorly drained depressions; where these are of sufficient size, they are mapped as the Scott silt loam.

The Holdrege silt loam is the dominant soil type throughout the area of its occurrence, but contains numerous smaller bodies of other soils within its borders. The type is not extensively developed in the northern half of the county, as most of the soils there are either of a sandy nature or low in organic matter. The Holdrege silt loam has been derived through weathering from loess.

The greater part of the surface of the type varies from nearly level to undulating, but some places are steeply sloping. It is usually less generally level than that of the Grundy silt loam, but not quite so uneven as that of the Colby soils. The greatest relief occurs along valley slopes in the southern and southeastern parts of the county.

The type as a whole is well drained. Surface drainage is not well established in the more nearly level parts, but the porous subsoil affords ample underdrainage. Water sometimes accumulates in small depressions, but these are seldom of sufficient size to detract from the general value of the land. The type is naturally retentive of moisture and withstands drought over prolonged periods.

The Holdrege silt loam is considered the best upland soil in the county. It is slightly superior to the Grundy silt loam for general farming, owing to the absence of the heavy hardpan layer and the more accessible moisture supply. In natural productiveness the type ranks with the best upland soils of the Mississippi Valley. Crop yields, however, are seldom as large as those obtained in Eastern States on account of the lower rainfall. In seasons of ample precipitation the yields of corn and alfalfa are about twice those of normal years.

This type originally supported a thick growth of grasses consisting of a mixture of grama, little bluestem, buffalo grass, wheat grass, and other species, all of which supplied excellent grazing and hay. Most of the native sod has been broken for crop production, although there are still many small tracts included in farm pastures.

Of the cultivated crops, corn, wheat, oats, rye, and alfalfa rank in acreage in the order named. Wheat is the chief cash crop, and most of the grain is sold in local elevators soon after threshing. The corn, oats, rye, and alfalfa are usually fed to stock on the farm or sold to local feeders. Crop yields vary widely from year to year, depending upon the rainfall. In normal years good yields are obtained, and even in dry years the yields are slightly larger than on the Grundy silt loam. The average yield of corn is about 30 bushels per acre, but maximum yields of 50 to 60 bushels have been obtained under good management and favorable rainfall conditions. Wheat yields 10 to 30 bushels per acre, the average for a period of years probably being about 18 bushels. The average yield of oats

is about 30 bushels, rye 20 bushels, and alfalfa 2 to 3 tons per acre. The latter crop is usually cut three times.

The livestock industry is an important adjunct to grain production on this type. Cattle are not raised extensively on account of the limited pasture, but many farmers buy stock for winter fattening. Hogs are raised on nearly every farm, and many farmers have large herds. All livestock intended for market is fattened on corn and alfalfa and shipped to Omaha, Kansas City, or Chicago.

The Holdrege silt loam can be cultivated under a rather wide range of moisture conditions. The soil clods if plowed when wet, but the lumps are easily reduced. Where properly tilled, it resists drought for long periods. Four-horse teams perform most of the farm work. Tractors are sometimes used on the more level areas.

Most of the corn on this soil is listed, although a few farmers prefer planting the grain in checkrows, as the crop is more easily kept free from weeds. Wheat and rye are planted in the fall with a press drill on plowed and disked corn or stubble land. Some wheat is drilled between the corn rows before the corn is gathered. Oats are sown in the spring, usually in the same manner as wheat. Alfalfa is sown broadcast on well prepared stubble ground, either in late summer or early spring.

Crop rotation is not systematically practiced, although the more progressive farmers have evolved systems which they use on their land and change the crops with reasonable regularity. Corn is grown 1 or 2 years, followed by oats or wheat 2 years, and alfalfa 3 to 5 years or until the stand begins to deteriorate. Many farmers, especially those on rented land, grow the same grain crop continuously for several years.

No commercial fertilizer is used. Barnyard manure is spread on the fields in late fall or early spring, but the supply is usually not sufficient for best results.

The land sells for $100 to $175 an acre, depending largely upon location, topography, and improvements.

Under the present system of extensive grain growing this type will depreciate in productiveness. A large proportion of the land should be in some leguminous crop, such as alfalfa or sweet clover, each year. The average farm should have at least 20 acres in legumes, or an average of about 5 acres in 50. The raising of more livestock would increase the available supply of manure, and this should be carefully returned to the land. On the steeper slopes surface wash can be retarded by constructing brush or rubbish dams along incipient drainage channels, thereby checking hillside erosion and preventing the removal of the fertile surface soil.

Holdrege silt loam, basin phase.—The Holdrege silt loam, basin phase, as it occurs in Kearney County, differs little from the typical Holdrege silt loam except in minor soil characteristics owing to more restricted drainage. The surface soil is a very dark grayish-brown to black heavy silt loam 10 to 18 inches deep. It is underlain by a dark-brown to brown, heavy, compact clay or silty clay which extends to an average depth of 30 inches. The lower subsoil is a moderately friable light-brown silt which continues below 36 inches. The surface soil and the compact subsoil horizon are not noticeably calcareous. The lower subsoil and substratum, however,

are rich in lime. The structural transition between the different soil horizons is rather abrupt. The surface and upper subsoil are rich in organic matter which imparts the dark color. The material gradually decreases with depth, but is seldom noticeably deficient within 30 inches.

The phase is very uniform throughout the areas of its occurrence, although it contains a few minor variations too small to show on the map. In the vicinity of areas of Scott silt loam, the heavy, compact subsoil layer often extends below the 3-foot depth and is locally mottled with white and rusty-brown splotches owing to poor drainage. Around the outer margins of the phase, where it borders areas of typical Holdrege silt loam, the compact subsoil horizon becomes thinner and more friable, and the two soils gradually merge so that it is often difficult to separate them.

This soil occupies a few basinlike depressions in the loess plain in the southern two-thirds of the county. It has been modified to some extent by sediments deposited from shallow waters standing over or flowing into the depressions. Drainage is adequate except during seasons of unusually heavy rainfall. There are generally a few poorly drained areas of Scott silt loam in the center of the depressions, where the water collects during rains.

On account of its small extent the phase is of little agricultural importance in Kearney County. It is very fertile, however, and practically all of it is under cultivation. Owing to its low position it receives run-off from the higher-lying soils, and crops rarely suffer as quickly during summer droughts as on the other types. Wheat and corn are the principal crops. Wheat occupied the larger acreage in 1923. Yields vary somewhat according to the season, although they are usually more uniform than upon the higher-lying soils because of the more favorable moisture supply. Wheat yields from 15 to 20 bushels per acre, and corn 25 to 35 bushels. The land is handled in the same manner as the surrounding Holdrege soils.

On account of its irregular occurrence in generally small areas, much of the Holdrege silt loam, basin phase, is held in farms in conjunction with other soils. It slightly enhances the value of the farm as a whole.

COLBY LOAMY SAND

The surface soil of the Colby loamy sand is a light grayish-brown loamy sand 6 to 8 inches deep. It is underlain by a light-gray, loose, very fine to fine pure sand, which gradually becomes lighter in color and finer in texture with depth. At about 30 or 36 inches it merges into the light-gray or almost white floury silt of the parent loess. The surface layer of 6 inches is moderately well supplied with organic matter; as a rule, however, it does not contain enough to prevent the soil from drifting when the native sod is destroyed. The soil and upper subsoil seldom contain sufficient lime to react with dilute hydrochloric acid. The lower subsoil, however, is usually highly calcareous and the substratum contains numerous lime concretions.

The type includes a few variations. In the more level areas the surface soil is slightly deeper and darker than usual, owing to a larger organic-matter content. In the more exposed situations, how-

ever, wind and water erosion have removed most of the organic matter, leaving the soil prevailingly shallow and light in color. Locally the upper soil horizons have been entirely removed, exposing either the light-gray sandy upper subsoil or the almost white highly calcareous substratum.

In a few places the soil differs from the typical in that the material is not noticeably calcareous within the 3-foot depth. Where this condition prevails the subsoil is usually very sandy throughout and resembles that of the Valentine sand, but is decidedly lighter in color.

The Colby loamy sand occurs as numerous small bodies scattered in a general east-west direction across the northern part of the county. Local developments also occur within the Sand Creek drainage basin in the southeastern part.

The type is usually found in close association with areas of Valentine sand or dunesand. The derivation of the soil is difficult to determine. It has evidently weathered from loess, as is indicated by the usually loesslike and highly calcareous nature of its lower subsoil and substratum. Whether this loesslike material represents the original deposit, such as occurs over the greater part of the uplands, or is recent stream transported and reworked valley or terrace loess, has not been definitely determined. There is considerable evidence to support the latter theory. In either case, the surface of this parent loessial deposit has been so modified by wind and water transported sands from the adjacent Valentine and dunesand areas, that only the deeper subsoil of the type retains its loessial characteristics. In many places the soil much resembles wind-blown material.

The surface ranges from gently undulating to decidedly hummocky or choppy. The greater part has a choppy relief such as is formed by wind in areas of loose sand. Surface drainage is poorly established, but the loose porous soil and subsoil frequently cause excessive internal drainage and during dry years crops sometimes suffer from lack of moisture.

The Colby loamy sand is an unimportant agricultural soil in Kearney County on account of its small extent, somewhat droughty nature, and the danger of soil drifting when brought under cultivation. About 80 per cent of it remains with its native covering of grasses, chief among which are bunch grass, bluestem, sand grass, and stipa or needle grass. The bunch grass usually occupies the less sandy portions or those areas where erosion has exposed the underlying fine-textured loessial material. Some grama grass occurs on the more level areas. Grazing is practiced more extensively on this type than on other soils derived from loess in Kearney County. Hereford is the leading breed of cattle. The native grasses will support 20 to 35 cattle on each quarter section during the summer grazing season. Of the cultivated crops, corn occupies the leading acreage, and yields range from 15 to 30 bushels per acre, depending upon the rainfall. Alfalfa yields 1½ to 2½ tons from two cuttings. This crop does fairly well after a stand is obtained, but it is extremely difficult to compact the soil sufficiently to insure maximum seed germination. Small grain is seldom grown on account of the danger of soil blowing and consequent injury to young plants.

The Colby loamy sand sells for $30 to $75 an acre, depending chiefly upon topography.

This type is not a good farming soil, and only the more nearly level and protected areas should be brought under cultivation. It makes fairly good grazing land but is very difficult to handle when the native sod is destroyed. On those areas now being farmed the soil should be protected against blowing as much of the year as possible. Coarse manure and rotted straw are beneficial in preventing soil drifting and should be applied to the land when available.

COLBY FINE SANDY LOAM

The surface layer of 6 or 8 inches of the Colby fine sandy loam is a brown to dark grayish-brown, loose, friable, fine sandy loam, underlain to about 20 or 30 inches by a yellowish-gray very fine sandy loam containing a relatively large proportion of silt. Below this, and continuing to great depths, the lower subsoil is a light-gray to almost white, loose, floury silt containing only a small percentage of very fine sand. The transition between the different soil horizons is very gradual in both color and texture. The surface soil contains only a moderate to low supply of organic matter and the subsoil is very deficient in this material. The latter below 24 inches is highly calcareous, and lime concretions are usually abundant below 30 or 36 inches.

The type as mapped in Kearney County includes a few variations, chiefly in the depth and color of the surface soil. In the more nearly level areas and a few of the shallow depressions the conditions have favored more rapid accumulation of organic matter than usual, and the soil is often dark brown in color and locally extends to depths of 8 or 10 inches. On the steeper slopes and the crests of knolls and ridges, however, the erosional effects of wind and water have greatly thinned the surface soil and reduced its organic-matter content, in places exposing the light-colored calcareous subsoil. In a few places throughout the type the material within 3 feet of the surface gives no reaction when dilute hydrochloric acid is applied; especially is this true northeast of Heartwell, but even in this locality there is no evidence of a lime deficiency.

The type also includes small areas of Colby very fine sandy loam and loamy sand, which were too small to separate on the map of the scale used in this survey.

Where the type borders areas of Valentine sand, the material in places consists of a yellowish-brown, loose fine sandy loam surface horizon, underlain at 8 to 10 inches by a yellow or light-gray, loose, loamy fine sand. This material changes rather abruptly at 20 to 36 inches to a yellow, friable, very fine sandy loam or silt.

The Colby fine sandy loam is rather extensively developed in this county. The largest area is a continuous strip, varying in width from one-half mile to about 1½ miles, extending across the north-central part in an east-west direction. This area, together with the associated Colby very fine sandy loam, appears to occupy a transitional zone between the silty soils of the southern part and the extremely sandy types in the northern part of the county. Smaller areas occur within the Sand Creek drainage area in the east-central and southeastern parts of the county.

The type has weathered from loess, although sandy materials, either blown from the coarser-textured Valentine soils and dune-sand or washed from sands within the loessial deposit, have greatly modified its character.

The surface is uneven, although usually not so rough as to hinder farming operations. The greater part is characterized by low, rounded hummocks, knolls, and ridges separated by intervening shallow depressions, giving rise to a choppy surface somewhat resembling that formed by wind in areas of loose sand. Locally along narrow valleys the type occupies moderate to steep slopes and is unsuited for farming. Drainage is good, being excessive only on a few of the steeper valley sides.

The type is a fairly important agricultural soil in Kearney County, chiefly on account of its large extent and favorable location. It is an average farming soil, and when carefully managed it produces fair yields of most crops common to the region. About 80 per cent of it is under cultivation. The soil is slightly subject to drifting when the native sod is broken and requires more careful management than either the Colby silt loam or very fine sandy loam types. The native vegetation consists of the same grasses as occur on the Colby silt loam, and in addition considerable sand grass and stipa. Corn, wheat, oats, and alfalfa are the principal cultivated crops. The yields of small grain and alfalfa are usually somewhat lower than on the heavier soils on account of the looser nature of the seed bed. Corn, however, yields about the same as on the heavier types. The uncultivated land is used for grazing. The native grasses will support 100 to 150 cattle per section when grazed only during the summer season.

The methods of farming are about the same as those practiced on the heavier types. This soil, however, can be handled with less power and lighter machinery than the silt loams on account of its open sandy nature. It can be cultivated under any moisture conditions without injury, providing care is taken to prevent soil blowing.

Land of the Colby fine sandy loam sells for $50 to $75 an acre, depending largely upon topography and improvements.

The successful management of this soil depends largely upon the conservation and increase of its organic matter. The addition of coarse manure and rotted straw and the prevention of soil drifting are means to this end. Corn should be listed deeply, with the furrows at right angles to the prevailing winds if possible. Alfalfa does fairly well on this soil and is an excellent crop to prevent drifting.

COLBY VERY FINE SANDY LOAM

The typical surface soil of the Colby very fine sandy loam, as it occurs in Kearney County, is a grayish-brown, loose, friable, very fine sandy loam 6 to 8 inches deep, grading into material of similar texture and structure and slightly lighter color, extending to a depth of about 18 inches. The lower subsoil is variable in texture and composition. Over most of the type it is a light-gray to almost white, loose, floury silt or silty clay, such as occurs in the lower subsoil of the Colby silt loam. Over considerable areas, however, especially adjacent to bodies of Colby loamy sand, the subsoil is much

coarser than usual and in places is a very fine or even a fine sandy loam in texture. The type is low in organic matter, as the color indicates. The subsoil and locally the soil itself is highly calcareous. The lower part contains numerous lime concretions.

The depth, color, and texture of the surface soil varies somewhat from the typical material in different localities. In the more level areas, where conditions have especially favored the growth and decay of plant life, the soil is often dark brown in color and about 8 inches deep. Upon the steeper slopes the organic matter has been largely removed by erosion, leaving the soil prevailingly shallow and light in color. In many places the surface soil has been entirely removed, exposing the almost white, highly calcareous silt of the parent loess. Locally throughout the type the surface soil contains so much silt as to approach a silt loam in texture. The Colby silt loam and very fine sandy loam types merge so gradually that it is often necessary to draw arbitrary lines separating them. The above variations occupy a rather large combined area, but the individual bodies are so small and scattered that it was not deemed advisable to show them on the soil map.

The type is rather extensive in Kearney County. It occurs chiefly as a broad, broken belt, varying in width from one-half mile to about 2½ miles, across the north-central part of the county. The type represents a transitional zone, both in texture and location, between the silt loam soils of the southern two-thirds and the more sandy soils of the northern part of the county. The soil is only locally developed in the southern half of the county.

The Colby very fine sandy loam has been formed by weathering from loess, the surface of which has been considerably modified by wind-blown sands from the surrounding types and by sandy materials within the loess itself. The topography is gently undulating to billowy. The greater part is characterized by low, rounded knolls or ridges with intervening level depressions. Most of the ridges and depressions extend in a general southeast-northwest direction. Locally along drainage ways the type is rather steeply sloping and severly eroded. Drainage is everywhere good. Stream channels are poorly developed in the more nearly level areas but the loose, porous soil and subsoil afford ample underdrainage. The type is fairly retentive of moisture, though it does not withstand drought quite so well as the Holdrege soils on account of its lower organic-matter content.

The land originally supported a thick growth of prairie grasses similar to those on the Colby silt loam. Most of the virgin sod has been broken for crop production; only about 10 per cent remains in native grasses and is used for pasture and hay land. A few beef cattle are grazed in the rougher parts of the type, but the grazing industry is not so well developed as on the more sandy soils of the county. The native cattle are mostly Hereford or Shorthorn grades. A few farmers ship in cattle for winter feeding. Hogs are raised on every farm. Duroc-Jersey and Poland-China are the principal breeds.

The chief cultivated crops are corn, wheat, oats, alfalfa, and rye, ranking in acreage in the order named. Wheat and rye are the principal cash crops and are usually sold in the local elevators soon

after threshing. Most of the corn, oats, and alfalfa is either fed on the farm or sold to local feeders.

Yields of all crops depend primarily upon the rainfall, and to a smaller extent upon the seed, condition of the soil, and care taken in managing the crops. In general the yields are about the same as those obtained on the Colby silt loam, and the soil is handled in much the same manner. In fact, the farmers recognize little difference between the two soils except that the very fine sandy loam is somewhat easier to handle and can be cultivated under a slightly wider range of moisture conditions.

The selling price of the type ranges from $50 to $125 an acre, depending largely upon the improvements, topography, and distance from markets.

The same methods of conserving and increasing the naturally low content of organic matter and preventing erosion as are recommended for the Colby silt loam will apply to this type.

COLBY SILT LOAM

The surface soil of the Colby silt loam, to an average depth of 7 inches, consists of an ashy-gray to grayish-brown silt loam having a smooth, velvety feel. The soil is ordinarily loose in structure, but becomes moderately compact if worked when wet. It is low in organic matter. The upper subsoil is of similar texture and structure, but slightly lighter in color. Below an average depth of 18 inches a lower subsoil is encountered in which the material becomes gradually lighter in color and looser in structure, changing to an almost white floury silt or silty clay below 24 or 30 inches. The naturally low organic-matter content decreases with depth and is practically absent in the lower subsoil. The surface soil is calcareous in places, and the lower subsoil has a high lime content.

The type is fairly uniform in texture throughout the area of its occurrence, although it varies considerably in the depth and color of its surface soil. On the more gradual slopes conditions have been favorable for the accumulation of larger quantities of organic matter than usual, and the surface soil is brown to dark brown in color and often 6 or 8 inches deep. Where such areas are of sufficient size to warrant mapping they are included with the Holdrege silt loam. The Colby and Holdrege silt loams differ mainly in that erosion has largely removed the black organic matter from the former, leaving it lighter in color. The areas of Colby silt loam along drainage ways are gradually being extended at the expense of the Holdrege soils. The principal variation in texture is toward a very fine sandy loam, and small bodies of Colby very fine sandy loam are included with this type.

The Colby silt loam occurs as large, usually elongated bodies in the northern half, and it is the dominant type along the narrow valleys in the southern part of the county. A large and uniform body extends west from Heartwell for several miles. Another large body lies north of Axtell in the west-central part of the county. The areas along the intermittent drainage ways in the southern part of the county are usually very narrow, though fairly continuous.

The type has weathered from loessial material under conditions unfavorable for the accumulation of organic matter in the surface

soil. The topography ranges from almost flat to billowy and in places is steeply sloping. The greater part is characterized by low, rounded hillocks or ridges and intervening level depressions. The narrow strips along stream valleys have moderate to steep slopes and are deeply eroded in places.

Drainage is everywhere adequate, though seldom excessive except upon the steeper valley slopes where erosion is active. Throughout the larger areas surface channels are poorly established, but the porous subsoil affords ample underdrainage.

The type is practically treeless, and the native vegetation consists almost entirely of prairie grasses, including grama, buffalo, and bunch grasses. The former two predominate on the more level and gently rolling areas, whereas the latter occurs chiefly upon the steep, eroded valley slopes.

The Colby silt loam is a rather important agricultural soil in Kearney County on account of its large extent. About 85 per cent of it is under cultivation, and the remainder, including the narrow strips of steeply sloping land, is used for pasture. Corn, wheat, alfalfa, oats, and rye are the most important cultivated crops. Wheat is the chief cash crop, although on farms where little livestock is kept most of the corn is sold. Small fields of sorgo, millet, and Sudan grass are occasionally grown. Orchard fruits do well in favorable seasons.

Crop yields are governed largely by moisture conditions, the condition of the soil, and the care used in planting and cultivating the crops. The yields of all crops excepting alfalfa are usually a trifle lower than those obtained on the Holdrege and Grundy soils, mainly because of the lower content of organic matter. Corn yields from 15 to 50 bushels, with an average of about 20 bushels per acre. The average yield of wheat is about 12 bushels, although in favorable years 20 to 30 bushels are obtained. The average yield of oats is about 20 bushels and of rye about 15 bushels per acre. Alfalfa yields 2 to 3 tons per acre from three cuttings. The soil is especially well adapted to alfalfa on account of its loose, friable structure and high lime content. Alfalfa is an excellent crop for the soil, as it prevents erosion and adds nitrogen and organic matter.

A few cattle are grazed on the rougher areas of this type, although cattle raising is not an important industry on account of the limited pasture. The grasses on 5 to 7 acres are considered sufficient to support a cow or steer where supplemented with feed during the winter months. Hogs are raised on every farm, and many farmers buy cattle for winter feeding.

The soil of the Colby silt loam is easily handled and can be cultivated under a rather wide range of moisture conditions. It tends to clod if plowed when wet, but the lumps are easily reduced. Care should be taken to prevent soil washing on valley slopes. Most of the corn is listed, as this method requires less time and labor than surface planting. Many farmers, however, prefer to plant in checkrows because the crop is more easily kept free from weeds. Wheat and rye are drilled in during the early fall on plowed and disked corn or stubble land. Oats are sown in spring in the same manner as wheat. Alfalfa is usually sown broadcast on plowed, disked, and harrowed stubble ground. The seed is sown either in the early

spring or middle summer, depending upon the moisture condition in the soil.

Only indefinite systems of crop rotation, subject to numerous variations, are practiced. Wheat or corn is often grown on the same ground for several consecutive years, and alfalfa or other legumes are seldom grown with regularity.

The Colby silt loam sells for $50 to $125 an acre, depending upon improvements, topography, and distance from markets.

The chief need of this soil is organic matter. The growing of legumes, raising more livestock, and the careful returning of straw and manure to the land are means to this end. In the more steeply sloping areas erosion can be retarded by the construction of temporary dams to retard the velocity of the run-off.

VALENTINE SAND

The surface soil of 6 to 14 inches of the Valentine sand consists of a grayish-brown, loose, incoherent fine to medium sand. It is underlain by a lighter grayish-brown, incoherent medium sand which continues to below 3 feet. The upper layer of 3 to 5 inches is slightly darker than the remainder of the surface soil, owing to a slight accumulation of organic matter, but this material is seldom sufficient to prevent drifting when the native sod is destroyed. The type is practically devoid of organic matter below 18 inches. Neither the soil nor subsoil is noticeably calcareous. The sand of which the soil is so largely composed is made up chiefly of angular particles of quartz and feldspar.

The type contains a few variations, chiefly in the color, depth, and organic-matter content of its surface soil. In local depressions, where conditions have favored the growth and decay of plant life, the soil is somewhat darker and deeper than usual, and over local areas contains sufficient organic matter to give it a rather loamy texture. In the more exposed situations, however, as upon the crests and slopes of the low rounded knolls and ridges, wind erosion has largely removed the organic matter, leaving the soil rather shallow and prevailingly light in color. In these localities there is usually very little variation in physical characteristics to depths below 3 feet. Where the type borders areas of Colby soils, the marginal areas often have a light-gray to almost white subsoil which from a distance appears very similar to that of the Colby series. The material is also considerably finer textured than is typical, probably owing to the incorporation of small quantities of wind-blown loess. It is, however, invariably almost pure sand or very fine sand of low lime content. These variations occupy a considerable total area, but usually occur in small scattered bodies. They differ but little agriculturally from the rest of the type and were not considered sufficiently important to warrant separate mapping.

The Valentine sand is one of the less extensive soils in Kearney County. It is developed chiefly in the northern part in irregular, usually elongated bodies, roughly parallel to the alluvial lands along the Platte River. Local developments lie within the Sand Creek drainage basin in the southeastern part of the county. The type generally occurs in close association with areas of dunesand. It has weathered from sandy material either carried down from regions

to the west by the Platte River or released from coarse deposits within and under the loess. The original material has been reassorted by wind and water to such an extent that it is not possible to classify it definitely in regard to origin.

The surface is flat to rolling, the greater part having a hummocky or billowy relief. Even the flatter areas are usually modified by scattered, low, rounded knolls, hummocks, and ridges. Surface drainage is poorly established, but the porous sands absorb and carry off the surplus moisture as fast as it accumulates, leaving the soil rather droughty during seasons of low rainfall.

The type is of little agricultural importance beyond its value for grazing. The low organic-matter content, low water-retaining capacity, and the danger of drifting when the native sod is destroyed combine to lower its value for crop production. Corn, kafir, and sorgo are grown occasionally in the lower depressions where moisture conditions are most favorable. Small grain is seldom grown, on account of the loose nature of the seed bed. Yields of all cultivated crops are usually low except during years of ample precipitation. About 90 per cent of the type remains with its native covering of grasses, and the grazing of beef cattle is the chief industry. Sand grass, stipa, big and little bluestem, and small amounts of grama grass comprise the greater part of the vegetation. These grasses will support 150 to 200 head of cattle on each square mile during the summer grazing season, or when cut for hay will yield one-fourth to one-half ton per acre, depending upon the rainfall.

The Valentine sand sells for $30 to $45 an acre, depending upon the topography, improvements, and distance from markets.

This type is better adapted to grazing than crop production, and only the lower-lying and more protected parts should be brought under cultivation. Even these should be stirred no more than is necessary to control weeds, as loosening the surface soil promotes drifting. Coarse manure and straw spread over the land aid considerably in keeping the soil stable. Corn should be deeply listed, with the ridges at right angles to the prevailing winds if possible.

SCOTT SILT LOAM

The surface soil of the Scott silt loam, to an average depth of 8 inches, is a dark grayish-brown, heavy silt loam containing considerable clay. It is rich in organic matter and when wet appears black. The upper subsoil usually consists of a thin layer of light-gray, loose, floury silt or silty clay, seldom over 4 inches thick. Below this to a depth of more than 3 feet the material is a heavy, compact clay or silty clay of drab to dark-gray color. The surface soil and lower subsoil have a low lime content, but the light-gray intermediate zone is often highly calcareous.

A few variations occur. In places the subsoil below 30 inches is less compact, lighter in color than usual, and somewhat calcareous, much resembling that of the Holdrege silt loam. The principal textural variations are toward a clay or silty clay and occur chiefly in the western part of the county. In this locality the type also often varies from the typical material as mapped in Kearney County in that the floury intermediate zone is very thin or entirely absent and

the surface horizon is underlain at about 10 inches by the heavy, compact, hardpanlike clay of the subsoil. Locally where the type occurs near or within soil bodies of a slightly sandy nature the surface soil has accumulated considerable very fine sand. These variations are usually scattered and unimportant, and are not separated on the soil map.

The type occupies small basinlike depressions, locally known as buffalo wallows, scattered throughout the heavier-textured upland soils. The areas seldom exceed 160 acres in size and mostly range from one-half acre to about 3 acres. One of the largest occurs on the north side of the railroad between Keene and Wilcox, in the southwestern part of the county. Smaller areas are scattered through the uplands south and west of Minden. The type has poor drainage, and in the spring after heavy rains water stands on the surface for periods of a few days to several weeks.

The Scott silt loam has been formed by wash from the surrounding higher land deposited over older material which now constitutes the subsoil. The lower subsoil, which is rich in organic matter, apparently is a very old soil formed by the deposition of clay and silt in standing water.

Owing to its small extent and poor drainage, the type is of little agricultural importance. It is, however, an excellent indication of good farming land, as most of the areas throughout this county, as well as the remainder of Nebraska, lie within some of the best upland farming soils in the region of their occurrence. Many of the smaller bodies in this county are within cultivated fields and are used for crop production. In normal years fair yields are obtained. During wet seasons the ground remains too moist for cultivation and in dry years the soil cracks badly, causing crops to suffer from lack of moisture. The larger developments of the type are used exclusively for farm pastures.

The greatest need of this soil is adequate drainage. It is doubtful, however, if the increased production would compensate the expense involved in draining such small areas. The bodies are usually too small to cause any appreciable decrease in total crop yields.

HALL SILT LOAM

The surface soil of the Hall silt loam is a dark grayish-brown, smooth, fine-textured silt loam 8 to 10 inches deep. It is rich in organic matter, which accounts for the dark color. The upper subsoil is a slightly compact silty clay loam of about the same color as the surface soil. Below an average depth of 18 inches the material gradually becomes lighter in color and looser in structure until at about 2 feet it merges into a light-gray and in places almost white, loose, floury silt which continues below 3 feet. The organic matter gradually decreases with depth and only faint traces occur below 24 inches. The lower subsoil is highly calcareous, and lime concretions are numerous in the substratum.

The type is very uniform throughout the area of its occurrence in Kearney County. Locally, however, small patches occur in which the calcareous subsoil horizon lies below the 3-foot depth. If these patches had prevailed over a sufficient area to warrant mapping,

they would have been classed with the Waukesha silt loam. The two types differ chiefly in the lime content of their subsoils.

The Hall silt loam is confined to one area of less than 2 square miles along a tributary of Sand Creek in the southeastern part of the county. The soil has weathered from alluvial and colluvial materials deposited when the stream was flowing at a higher level. Subsequent deepening of the channel has left the deposit as a terrace or bench, 10 to 15 feet above the present channel.

The surface is flat, with a gentle slope down the valley and toward the stream axis. Drainage is good, as there is sufficient slope to carry off all surplus moisture.

Owing to its small extent, the type is of little agricultural importance in this county. It is a good producing soil, however, and in counties where it is more extensively developed it is highly prized for general farming on account of its level topography, high moisture-retaining capacity, and fertility. All of the soil in this county is under cultivation to corn, wheat, alfalfa, and oats. The yields are slightly higher than those obtained on the adjoining uplands as the type is more favorably situated for the accumulation of moisture from the higher levels and from the underlying water table. Corn yields 30 to 50 bushels, wheat 15 to 30 bushels, oats 30 to 35 bushels, and alfalfa 3 to 3½ tons per acre from the three cuttings. The soil is tilled and the crops are handled in the same manner as on the Holdrege silt loam.

On account of its small extent, no separate sale value can be given for this soil in Kearney County. In other counties it ranges from $150 to $200 an acre.

SPARTA GRAVELLY SANDY LOAM

The Sparta gravelly sandy loam consists of a light grayish-brown or grayish-brown mixture of all grades of sand, together with large amounts of fine and medium gravel, to depths of more than 3 feet. The surface layer of 6 to 8 inches is slightly darker in color and finer in texture than the remainder of the soil section because of more extensive weathering and the accumulation of some organic matter. The latter, however, is not present in sufficient quantities to prevent the finer sands from drifting when the native sod is destroyed. Over parts of the type the material below 12 inches is coarser than usual and at 24 inches consists of light-gray coarse sand and gravel. Both soil and subsoil are low in lime. The latter is almost devoid of organic matter.

Southwest of Lowell, in the northeastern part of the county, the surface layer of 6 inches is better supplied with organic matter and is somewhat darker than usual. If this variation were more extensive it would be mapped with the O'Neill series, but owing to its occurrence in small patches it is not separated on the soil map. The Sparta and O'Neill soils differ only in the color and organic-matter content of their surface layers. The former is new soil, and sufficient time has not elapsed for the development of the dark color so characteristic of the surface horizon of the O'Neill soils.

The Sparta gravelly sandy loam occupies a narrow continuous strip varying in width from one-fourth to about 1 mile across the

northern part of Kearney County. It represents a portion of the Platte River terrace lands and has weathered from coarse alluvial materials deposited by the stream when it was flowing at a higher level. Wind-blown sands from the adjoining flood-plain soils and from the near-by Valentine and dunesand areas have also contributed to its formation. The surface of the type is flat, with a gentle slope toward the north and east. It lies 5 to 15 feet above the flood plains.

The drainage is excessive. Surface channels are poorly developed, but the loose, gravelly subsoil carries off the moisture as fast as it accumulates. The soil is of little agricultural value on account of its droughty nature, and practically all of it is included in pasture land. During dry years even the native grasses wither and turn brown from lack of moisture. A few small patches of corn and potatoes are grown on this type, south and west of Lowell in the northeastern part of the county, but the yields are low. The gravelly subsoil is used locally for building purposes and for surfacing highways. The type supports a fair growth of grama and sand grass. Cactus is abundant. The grasses usually wither during midsummer and can not be depended upon for late grazing. This land sells for $15 to $25 an acre, depending largely upon improvements.

SPARTA SAND

The Sparta sand consists of a light grayish-brown or gray, loose, incoherent sand to a depth of more than 3 feet. The surface layer of 6 to 10 inches is usually slightly darker than the remainder of the soil section, owing to a small accumulation of organic matter. The entire soil profile is very low in lime and gives no reaction with dilute hydrochloric acid.

The type occurs chiefly in the northern part of the county as narrow broken strips bordering the Sparta gravelly sandy loam. Small areas occur along Sand Creek in the east-central part of the county.

The type has developed upon slightly weathered alluvial sands deposited upon the flood plains when the streams were flowing at higher levels. The accumulation of wind-blown sands from the surrounding types has also contributed to its formation. The type is of recent origin and sufficient time has not elapsed to develop the dark-colored surface layer so characteristic of the O'Neill soils. The latter differ from this type only in the larger organic-matter content and consequently darker color of their surface horizons. The soil is similar in physical characteristics to the Valentine sand, differing chiefly in its more even topography and in its mode of formation.

The surface is flat to very gently undulating, though locally modified by low sand hummocks and ridges. The type lies 5 to 20 feet above the stream channels. Drainage is good and over considerable areas it is excessive. The porous sand absorbs and carries off the moisture by subterranean drainage almost as fast as it accumulates. Even in the more excessively drained portions, however, the type is more retentive of moisture and has a higher grazing value than the Sparta gravelly sandy loam, on account of the finer texture of its subsoil.

The Sparta sand is not adapted to farming because of its low content of organic matter, excessive underdrainage, and the danger of soil drifting when the native sod is destroyed. Practically all of it is used for grazing land. Corn and potatoes are grown on a few of the more protected areas, but the yields, especially of corn, are low except during seasons of ample rainfall.

The native vegetation consists of the same grasses as occur on the Valentine sand, and the soils have about the same grazing value and sale price. In fact, the farmers recognize little difference between the two types. The Valentine sand has a more uneven relief, but as both soils are used primarily for grazing the topography has little bearing upon the value.

O'NEILL SANDY LOAM

The surface soil of the O'Neill sandy loam is a dark-brown sandy loam 8 to 12 inches deep. It is composed largely of the finer grades of sand, with sufficient silt, clay, and organic matter to give it a loamy character. The soil passes abruptly into an incoherent light-brown to gray, almost pure sand, which extends below 3 feet. Scattering small pebbles usually appear at about 20 inches, and in many places coarse sand and gravel are encountered below 30 inches. The sand of which the type is so largely composed consists of angular or slightly rounded quartz grains, with small quantities of feldspar. Neither soil nor subsoil is noticeably calcareous. The principal variations in surface texture are toward a sand or loamy sand, especially around the margins of the type where it borders the Sparta gravelly sandy loam. It usually contains sufficient organic matter, however, to give it a decidedly darker color than the Sparta soils.

The type is confined to two areas upon the terrace bordering the Platte River bottoms, one east of Lowell and the other west of Newark. Its total area is 3 square miles. The soil has weathered from sandy alluvial materials deposited by the Platte River when it flowed at a higher level. Wind-blown sands from the surrounding types have also contributed to its formation.

The surface is flat to very gently undulating. Surface drainage is poorly developed, but the underdrainage is usually excessive owing to the porous nature of the soil material. Crops suffer from lack of moisture except in the seasons of excessive rainfall. During dry years even the native grasses wither and dry up and can not be depended upon for late grazing.

Only a very small part of the type is under cultivation. Corn is grown, but produces low yields. Most of the soil is included in pasture land. It has a slightly higher grazing value than the Sparta sand or gravelly sandy loam on account of its larger content of organic matter. The selling price of the O'Neill sandy loam ranges from $40 to $50 an acre.

CASS LOAMY FINE SAND

The surface soil of the Cass loamy fine sand is a dark grayish-brown, loose, rather incoherent fine sand 6 to 10 inches deep. It is fairly well supplied with organic matter, which gives it a dark color and loamy character, but is not sufficient to prevent blowing

when the soil is not protected by a vegetative covering. The type is therefore less stable than either the fine sandy loam or very fine sandy loam members. The subsoil is a gray, fine to medium sand, which usually extends below 36 inches with little change. It is loose and incoherent when moist, but contains enough silt and clay to bind the sand particles together rather firmly when dry. The entire soil section is low in lime. The lower subsoil is very deficient in organic matter, and locally it contains rusty-brown stains due to poor drainage.

The type has a total area of about 1 square mile and is confined to a few narrow strips bordering the south channel of the Platte River in the northern part of the county. It has developed upon sandy alluvium of recent origin, deposited on the present flood plain of the stream during periods of high water. Wind-blown sands from the river channel have also contributed to its formation. Subsequent weathering and the accumulation of organic matter have given the sand a loamy texture.

The surface is flat, locally modified by low ridges and hummocks composed of almost pure sand. The type is seldom subject to overflow and has fair underdrainage. In a few places, however, the water table rises so near the surface in wet years as to produce small patches of marshy land. In dry years the underdrainage is excessive and native vegetation suffers from lack of moisture.

The Cass loamy fine sand is not a farming soil on account of its uncertain drainage and the danger of blowing when cultivated. All of it is used for grazing. It has a lower organic-matter content than the heavier Cass types and consequently a lower grazing value.

No sale price is available for this type on account of its small extent. It is probably worth $10 to $20 an acre as grazing land.

CASS FINE SANDY LOAM

The surface soil of the Cass fine sandy loam is a dark-gray or dark grayish-brown, loose fine sandy loam, 10 to 14 inches deep. It contains a relatively large percentage of very fine sand and small amounts of the medium and coarse grades. The upper subsoil is a grayish-brown loamy fine sand, which is loose and incoherent in its natural condition, but contains sufficient silt and clay to bind the sand together rather firmly when dry. Below an average depth of 24 inches the material gradually becomes less coherent and lighter in color until at 3 feet it is a light-gray, medium to coarse sand containing scattering gravel. Rusty-brown stains are encountered locally below 24 inches. The surface layer of 8 or 10 inches is generally well supplied with organic matter, but the material decreases with depth and only slight traces occur below 30 inches. The type as a whole is not noticeably calcareous, but in local patches both the soil and subsoil have a rather high lime content.

The type as mapped includes a few variations. In places the soil profile is very uniform in texture, color, and structure to depths below 3 feet, and locally the subsoil is even finer in texture than the surface soil. Had the former condition prevailed over a sufficient area to warrant mapping, the soil would have been classed with the Genesee series, but owing to its small extent and patchy occur-

rence it was included with this type. The principal textural variation is toward a very fine sandy loam, and it is possible that small bodies of Cass very fine sandy loam are included with this soil.

The Cass fine sandy loam occupies a continuous strip from 1 to 2 miles wide across the northern edge of the county, where it is the dominant flood-plain soil along the Platte River. The parent material was sandy alluvium deposited by the stream during comparatively recent times. Subsequent weathering and the accumulation of organic matter have greatly modified the surface of the original deposit.

The topography is generally flat, modified in places by slight depressions, old stream channels, or low mounds of almost pure sand. The surface lies from 8 to 12 feet above the normal flow of the river and is not subject to overflow. Drainage is variable; it is mainly subterranean, and during normal seasons the greater part of the type has adequate underdrainage for maximum crop production. In wet seasons the water table rises too near the surface over large areas for profitable farming, and even in normal years small bodies remain too moist for best results. In very dry years the underdrainage is excessive and crops do not do so well as on types with heavier subsoils.

About 70 per cent of the Cass fine sandy loam is under cultivation and the remainder is used for pasture and hay land. The native vegetation consists of a rank growth of prairie and marsh grasses, which will support 300 to 400 cattle per square mile during the summer grazing season, June to October, or when cut for hay will yield three-fourths to 1 ton per acre, depending upon the rainfall. The hay on this type is much coarser and has a lower feeding value than that obtained on the better drained soils. Its larger yield, however, tends to offset its inferior quality. The grazing value of this type could be greatly improved by the introduction of tame grasses and clovers.

Of the cultivated crops, corn and alfalfa occupy the leading acreage. Small grain is not grown extensively on account of the loose character of the seed bed. Yields vary widely, depending upon the rainfall. The average yield of corn for a period of years is probably about 25 bushels and of alfalfa about 2 tons per acre per season. The alfalfa is usually cut three times.

The soil is easy to handle and can be cultivated under any moisture conditions without injury. It can be tilled with less power and lighter machinery than is required for the heavier-textured soils of the county. The land is generally plowed once in three or four years, as double disking the surface is sufficient for either corn or alfalfa.

The selling price of the Cass fine sandy loam ranges from $25 to $60 an acre, depending upon its drainage and adaptability to crops.

CASS VERY FINE SANDY LOAM

The surface soil of the Cass very fine sandy loam is a dark grayish-brown very fine sandy loam, 8 to 12 inches deep, which contains a large amount of silt and organic matter and only a small percentage of particles coarser than fine sand. The subsoil is an incoherent fine sand to very fine sand which usually continues below 36

inches, though locally it becomes coarser with depth, and in places it consists of a mixture of coarse sand and fine gravel below 30 inches. In the upper part it is gray or grayish brown, but gradually becomes lighter in color with depth owing to the diminishing content of organic matter, and below 2 feet it is usually very light gray or almost white. It is locally modified with brownish iron stains, indicating poor drainage. The type is not generally calcareous, though in places the soil and upper subsoil contain sufficient lime to react with dilute hydrochloric acid.

The type is confined to a few small bodies west of Newark and to a small area along the boundary in the extreme northwestern part of the county. Its total area does not exceed 2 square miles. The type has weathered from sandy alluvium deposited in the Platte River bottoms during periods of high water. Subsequent to its deposition, weathering and the growth and decay of plant life have greatly altered the character and color of the surface horizon.

The topography is level, and surface drainage is poorly established. The underdrainage, however, is adequate and in dry years slightly excessive on account of the porous nature of the subsoil. The type as a whole is better drained than the Cass fine sandy loam.

The Cass very fine sandy loam is a fair farming soil and very well adapted to corn and alfalfa. Practically all of it is under cultivation. The average yield of corn is about 30 bushels and of alfalfa 2½ tons per acre. The type is handled in the same manner as the heavier-textured upland soils. No definite land values are available, as the soil seldom occupies entire farms. It has a tendency to increase the general value of the farms on which it occurs.

SARPY SAND

The Sarpy sand consists of a very light brown to grayish-brown, loose, incoherent fine to medium sand, which extends below the 3-foot depth with little change, except that the lower subsoil is usually slightly coarser in texture. The surface layer of 6 or 8 inches is somewhat darker than the remainder of the soil section from a slight accumulation of organic matter. The type is seldom noticeably calcareous.

In a few places the material below 24 inches is light-gray coarse sand and fine gravel. Locally the subsoil is modified by rusty-brown stains due to poor drainage. These variations, however, are of such small extent and minor importance that they were not separated on the soil map.

The Sarpy sand is confined to a very narrow strip bordering the south channel of the Platte River. The strip varies in width from a few rods to about one-fourth mile. The soil is composed of recent alluvium, deposited in the stream bottom during periods of high water. It has not weathered sufficiently to have developed the dark-colored surface layer characteristic of the Cass soils. In many places it resembles Riverwash as mapped in other counties of Nebraska. It is more stable, however, and not so greatly influenced by each slight rise of the stream.

The surface of the type is for the most part flat, though locally modified by low, rounded knolls, hummocks, and slight depressions.

Drainage is variable, depending largely upon the water level in the stream. During dry years the type has thorough and in many places excessive drainage, owing to the loose nature of the soil and subsoil. In wet years much of the soil is subject to frequent overflow, and even when not inundated the water table lies so near the surface as to make the land useless for crop production.

All of the Sarpy sand is included in pasture. The native vegetation is sparse, and the land does not have a high value even for grazing. Narrow strips of scrub willow and cottonwood occur along the stream channel. In a few places the subsoil material is used for building purposes. No sale value is available for this type, as it occupies but a small percentage of the farms bordering the stream.

The soil should be used exclusively for pasture land, as the uncertain drainage, low organic-matter content, and danger of drifting when cultivated make it unsuited for crop production. The grazing value of the type could be greatly improved with tame grasses and clover, and the value of land for firewood and post material could be increased by planting trees that are known to thrive under the local conditions.

DUNESAND

The material mapped as dunesand consists of a light-brown or grayish-brown, smooth, incoherent, fine to medium sand, which extends below the 3-foot depth with little change in texture, structure, or color. The immediate surface contains some organic matter, but not enough to prevent drifting when cultivated. The type is fairly retentive of moisture, considering its loose structure. The material is not noticeably calcareous.

There is little variation in the dunesand throughout the area of its occurrence in Kearney County, although locally, the material contains more silt, clay, and organic matter than usual, owing probably to longer undisturbed weathering and more favorable conditions for the growth and decay of plants. The loamier areas have a thicker grass covering than most of the type and therefore a greater grazing value.

Dunesand is rather extensively developed across the northern part of the county. It occurs chiefly as large, irregular, and usually elongated bodies lying roughly parallel to the alluvial lands along the Platte River. Smaller developments occur around Sand Creek in the southeastern part of the county. The type has been formed from the same material and in about the same manner as the Valentine sand. It differs chiefly in its more uneven surface, lower organic-matter content, and less stable nature.

The topography varies from steeply rolling to hilly. The sand has been piled into dunes varying in height from 20 to 50 feet. Blowouts are numerous, although at present only a negligible part of the type is subject to active wind erosion.

Dunesand has a lower value for grazing than the Valentine sand. It is of little value for crop production, as the destruction of the native sod is followed by excessive wind erosion. A few patches here and there are being farmed, mainly for corn. The yield is poor, especially after the first year, as most of the organic matter blows out, leaving only a gray sand for seed bed. Practically all of

the dunesand is in pasture, though some hay is cut on the more level areas. The native vegetation includes a great number of grasses, of which long-leafed reed grass, redfieldia, and stipa are the most common. These grasses will maintain 75 to 150 head of stock per square mile during the summer grazing season, June to October.

The price of dunesand ranges from $15 to $25 an acre, depending largely upon improvements.

The preservation of the native grasses is the foundation of the only industry to which dunesand is adapted. During recent years the vegetation has greatly increased under careful grazing management and the control of disastrous prairie fires. More is lost than gained by cultivating this soil, as when the native sod is broken the drifting sand usually influences a considerably larger area than the one originally disturbed, and it requires years for prairie grasses to resod the incoherent sand.

SUMMARY

Kearney County is in south-central Nebraska. It is almost square and comprises an area of 516 square miles, or 330,240 acres.

The county is in the loess region of Nebraska. About four-fifths of the area is upland, and the remainder includes the alluvial lands, or terraces and flood plains. The surface of the uplands is prevailingly flat to gently rolling, except in the more sandy regions where wind action has produced a choppy to hummocky relief. The alluvial lands are generally flat to very gently undulating. The county has an average elevation of about 2,150 feet above sea level. The general slope is toward the east.

The drainage is effected through the Platte River and its tributaries and through the headwaters of tributaries leading into the Republican and Little Blue Rivers. With the exception of the flatter upland areas and locally upon the bottom lands, the county is well drained.

The first white men to locate in the area now included in Kearney County were soldiers who established a fort in the northern part in 1848. According to the 1920 census, the population of the county is 8,583. It is all classed as rural. Minden is the county seat and largest town.

The transportation facilities are good. Practically all points in the county are within 9 miles of a railroad station. Public roads generally follow section lines.

The climate of the county is favorable for the growing of hay crops, vegetables, and grains and the raising of livestock. The mean annual temperature is 49.9° F., and the mean annual precipitation is 29.04 inches. The average growing season is 153 days, which is ample for maturing all crops common to the region.

The agriculture of the county consists of diversified farming, including the growing of grain and hay and the raising of livestock. According to the Nebraska Department of Agriculture, corn, wheat, oats, barley, alfalfa, wild hay, sorgo, and Sudan grass were the leading crops in 1923.

The livestock industry consists chiefly of cattle grazing and feeding and the raising of hogs.

Systematic crop rotation is not practiced, although the more progressive farmers use indefinite systems and change their crops with reasonable regularity. No commercial fertilizer is used, and the supply of barnyard manure is seldom adequate for best results.

The farm improvements are usually good. Most farms are equipped with modern machinery. Some tractors are used for plowing.

Land prices range from $10 to $175 an acre, depending upon topography, drainage, character of the soil, improvements, and location with respect to markets. The average price is about $90 an acre.

All the soils of Kearney County have either loess or sand as their parent material. Each of these materials has been subjected to various degrees of weathering, which have produced marked differences in the color, structure, and chemical and physical composition of the resultant soils. This weathering process has been controlled largely by the topography and drainage.

The loessial material has given rise to the soils of the Grundy, Holdrege, Hall, Colby, and Scott series. The sandy material of the county has given rise to the soils of the Valentine, Sparta, O'Neill, Cass, and Sarpy series.

The Grundy silt loam is the dominant soil throughout the flatter upland parts of the county. It is best developed between Minden, Axtell, and Keene in the southwestern part. It is a valuable general-farming soil and adapted to all crops common to the region.

The Holdrege silt loam is the dominant soil in the southern half of the county. It is considered slightly superior to the Grundy silt loam for farming on account of the less compact nature of its subsoil. The Holdrege very fine sandy loam has a slightly lighter texture in the surface soil.

The Colby silt loam is extensively developed in the northern half of the county. It is low in organic matter, but has a high lime content. The smoother areas are suited to general farming, though they are slightly less productive than the soils of the Holdrege series. The lighter types of the Colby series are derived from both loessial and sandy materials, and are less valuable for general farm crops.

The Valentine sand is of little agricultural importance on account of its low organic-matter content and unstable nature. Most of it is used for grazing.

The Scott silt loam occupies small depressions throughout the flatter parts of the loessial uplands. Owing to its poor drainage the soil has little agricultural value, and is used chiefly for grazing.

The Sparta gravelly sandy loam and the Sparta sand occur on the Platte River terrace in the northern part of the county. They are low in organic matter and droughty, and are practically all included in pasture land.

The O'Neill sandy loam occurs on terraces bordering the Platte River bottoms. The surface soil is well supplied with organic matter, but the subsoil is open and porous, and crops generally suffer from lack of moisture.

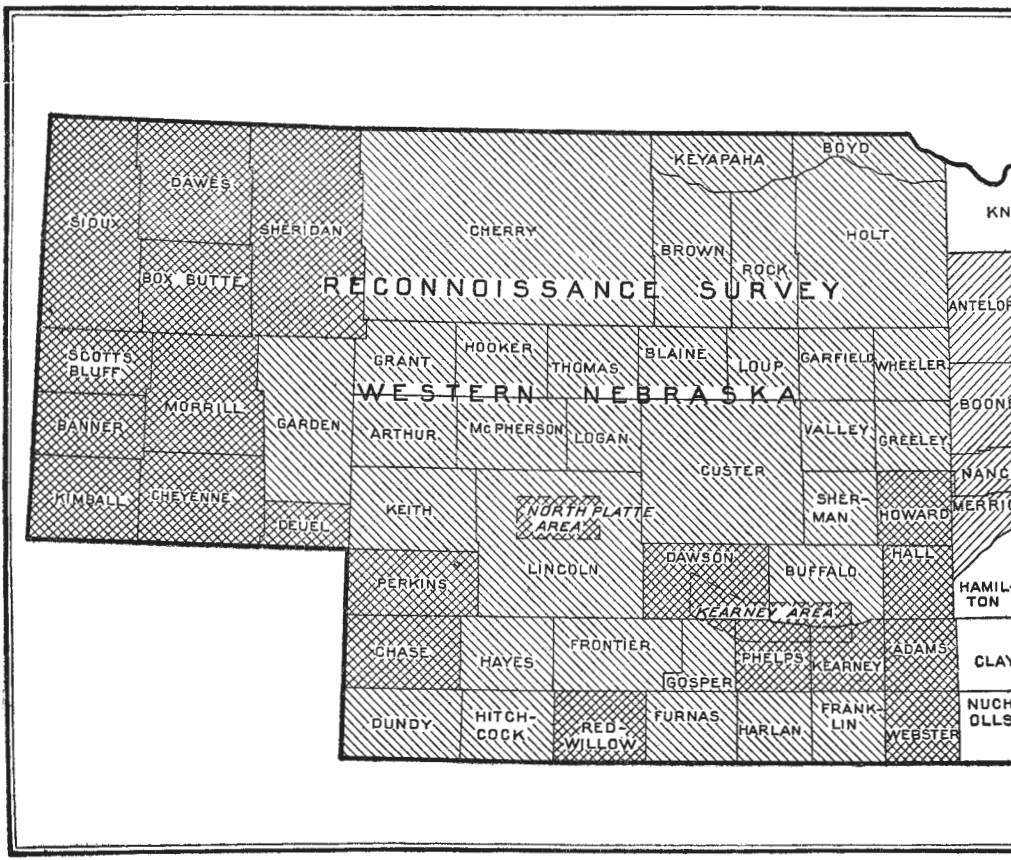
The Hall silt loam occupies a small area on a terrace along a tributary of Sand Creek. The soil is very productive.

The Cass fine sandy loam occupies a considerable area upon the Platte River flood plains in the northern part of the county. About 70 per cent of it is under cultivation. Corn and alfalfa are the leading crops. The Cass very fine sandy loam has about the same value for crops, but is of small extent.

The Sarpy sand is confined to a very narrow strip along the south channel of the Platte River. It is low in organic matter and subject to frequent overflow, and is used for pasture.

Dunesand is mapped along the southern edge of the Platte River alluvial lands and locally around Sand Creek. It consists of windblown material, and provides some pasturage.

O



Areas surveyed in Nebraska, shown by shading

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Office of the Assistant Secretary for Civil Rights
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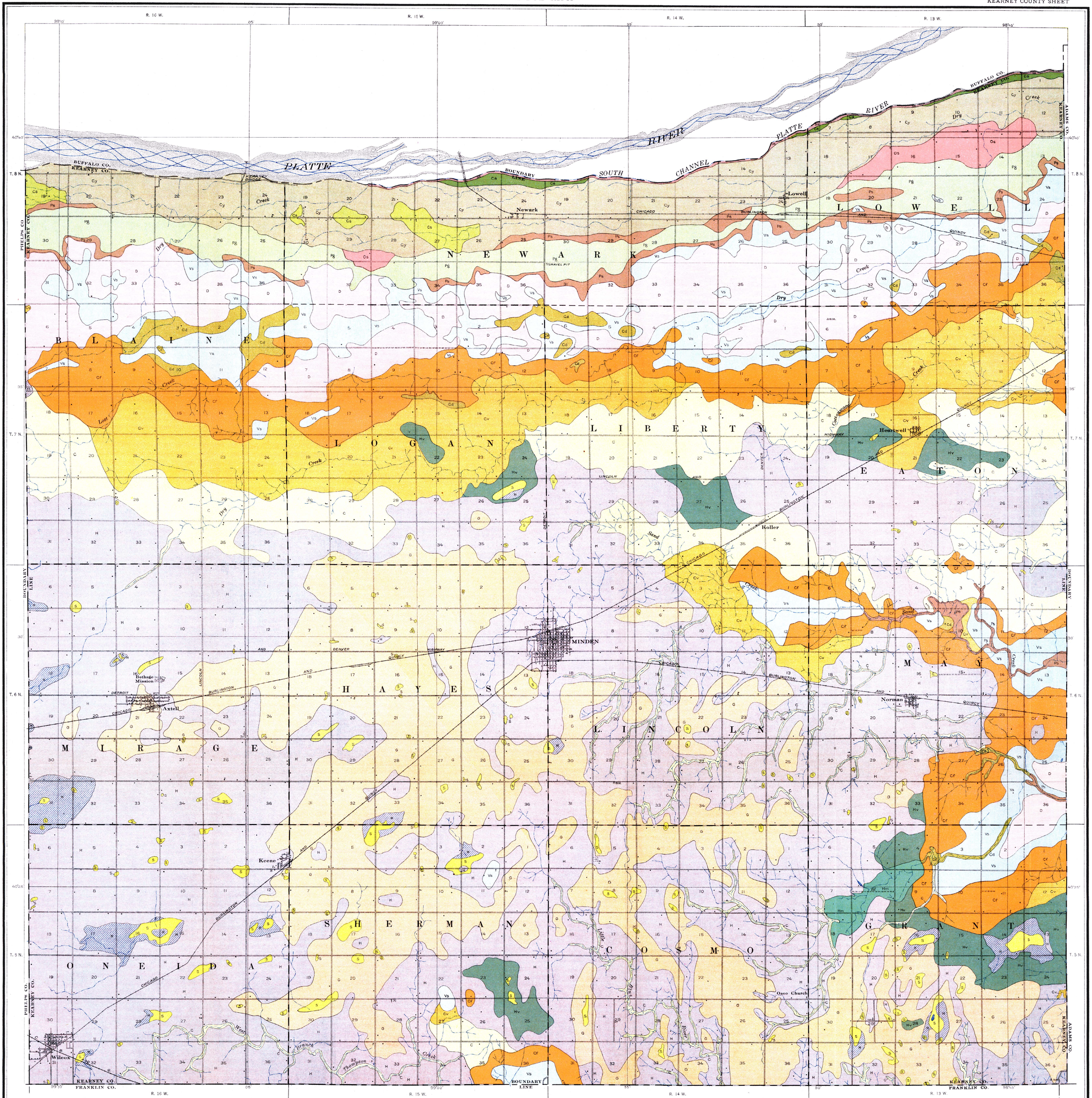
U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF SOILS
IN COOPERATION WITH THE
STATE SOIL SURVEY OF THE
UNIVERSITY OF NEBRASKA

SOIL MAP

NEBRASKA
KEARNEY COUNTY SHEET



LEGEND

- Cass loamy fine sand (Cs)
- Holdrege very fine sandy loam (Hv)
- Cass fine sandy loam (Cy)
- Holdrege silt loam (H)
- Cass very fine sandy loam (Ca)
- H, Basin phase
- Colby loamy sand (Cd)
- O'Neill sandy loam (Os)
- Colby fine sandy loam (Cf)
- Sparta sand (Ps)
- Colby very fine sandy loam (Cv)
- Sparta gravelly sandy loam (Ps)
- Colby silt loam (C)
- Sarpy sand (Ss)
- Grundy silt loam (G)
- Scott silt loam (S)
- Hall silt loam (Hm)
- Valentine sand (Vs)
- Dunesand (D)

CONVENTIONAL SIGNS

CULTURE
(Printed in black)

- City or Village, Roads, Buildings, Wharves, Jetties, Breakwater, Levee, Lighthouse, Fort.
- Secondary roads and Trails
- Railroads, Steam and Electric
- Bridges, Ferry
- R.R. crossings, Tunnel
- Ford, Dam
- School or Church, Cemeteries
- Mine or Quarry, Mine dumps, Made land
- Bluff, Escarpment, Rock outcrop and Triangulation station
- Stony and Gravelly areas
- Soil boundaries
- Boundary lines
- Boundary lines
- Boundary lines
- U.S. township and section lines

RELIEF
(Printed in brown or black)

- Contours, Depression contours
- Prominent Hills, Mountain Peaks
- Sand, Wash and Sand dunes
- Shore and Low-water line, Sandbar

DRAINAGE
(Printed in blue)

- Streams
- Lakes, Ponds, Intermittent lakes
- Intermittent streams
- Springs, Canals and Ditches, Flumes
- Swamp, Salt marshes
- Submerged marsh, Tidal flats

The above signs are in current use on the soil maps Variations from this usage appear in some maps of earlier dates

Soils surveyed by M. H. Layton, in charge, A. N. Huddleston and G. E. Conlin of the Nebraska Soil Survey and F. A. Hayes of the U. S. Department of Agriculture.

Scale 1 inch = 1 mile
1 ½ 0 1 2 3 4 Miles

A. Hoen & Co. Lith. Baltimore, Md.

Field Operations
Bureau of Soils
1923